ENVIRONMENTAL ANALYSIS

3.1 GEOLOGY

Physiography

3.1.1.1 Existing Environment

The ELI Project pipeline route is located within the Atlantic Coastal Plain physiographic province in the Long Island Sound, and the Embayed section of the Atlantic Coastal Plain physiographic province on Long Island. The landscape along the proposed pipeline route was formed from the deposit of glacial moraine during the Wisconsin stage of the ice age.

Long Island Sound

The Sound is one of the largest estuaries along the Atlantic Coast of the United States. The ELI Project crosses the Sound between MPs 0.0 and 17.1. The Sound is a semi-enclosed, northeast-southwest trending basin that is approximately 113 miles long and 20 miles across at its widest point. Its mean water depth is approximately 80 feet. The eastern end of the Sound opens to the Atlantic Ocean through several large passages between islands, whereas the western end is connected to New York Harbor through a narrow tidal strait called the East River. The Connecticut River is the main source of sediments to the Sound.

Long Island Sound consists of three regions or basins: eastern basin, central basin and western basin. The eastern basin is the deepest, with depths exceeding 300 feet in certain areas. The central basin is the largest with average depths of approximately 100 feet. The western basin is the smallest of the basins and is often characterized as part of the central basin.

Four types of bottom sedimentary environments have been identified in Long Island Sound. These environments reflect the major processes occurring in the area, specifically erosion, bedload transport of coarse-grained material, sorting and reworking of sediments, and deposition of fine-grained material (Knebel et al. 1999). Fine-grained material covers 50 percent of the area, primarily large portions of the central and western Sound. Areas of sediment sorting cover approximately 22 percent, and coarse-grained materials approximately 16 percent of the area. Coarse-grained material is present mainly in the east-central portion of the Sound. Erosional depositional areas cover approximately 10 percent of the area, at the eastern entrance to the Sound, on top of the Stratford and Norwalk Shoal complexes in the central and western portions of the Sound, and within the axial depression where it cuts across the two shoal complexes.

The ELI Project would cross the central part of the Sound. The basement rock along the proposed pipeline route in the Long Island Sound is metamorphic (gneiss and schists) of the Paleozoic age. Along the proposed pipeline route, the Sound bottom generally consists of broad areas of smooth sea floor that slope toward an east-west axial depression which has depths of 100 to 200 feet. Bottom sediments typically consist of silt and clay and fine-grained sediments.

Brookhaven, New York

The coastal plain landscape along the proposed pipeline route was formed from two prominent till moraines and gently sloping outwash plains. During the Wisconsin stage of the ice age, a central ridge called the Ronkonkoma moraine and a hilly terminal moraine called Harbor Hill moraine were formed. These moraine deposits typically consists of poorly sorted mixtures of clays, silts, sands, and coarse fragments approximately 30 feet to 100 feet thick (Cadwell 1989). Elevations range from sea level to 180 feet. The proposed pipeline would cross the Harbor Hill and Ronkonkoma moraines at 60 to 140 feet, respectively.

Glacial deposits along the pipeline route consist of stratified coarse to fine gravels with sand, with the higher percentage of finer-grained material further away from the moraines. Outwash deposits are approximately 5 to 50 feet thick (Cadwell 1989) and ground surface elevations where the alignment crosses glacial outwash areas generally range from 10 to 60 feet.

The bedrock geologic units in the proposed project area on Long Island Sound are of the Cretaceous Monmouth Group, Matawan Group, and Magothy Formation (Fisher et al. 1970, Busiolano et al. 1998). This assemblage of units is comprised of semiconsolidated coastal deposits of silty clay, sand, gravel, and glauconitic (shallow marine) sandy clay.

Aboveground Facilities

Iroquois proposes to construct a new compressor station (the Devon Compressor Station) at the site of the existing Milford Sales Meter Station in the City of Milford, New Haven County, Connecticut; and install equipment and/or modify facilities at its Brookfield and Dover compressor stations. The geology of these three sites is discussed below.

<u>Brookfield Compressor Station</u>

Iroquois proposes to install a new gas filtration system and meter station at the Brookfield Compressor Station in the Town of Brookfield, Fairfield County, Connecticut. The proposed project area is located in the Western Uplands section of the New England physiographic province. Topography in the project area is characterized by rolling hills and low, rounded mountains interrupted by numerous, generally narrow valleys (Alter 1995). Elevations at the proposed project site range from approximately 380 to 432 feet. Bedrock underlying the site is Ratlum Mountain Schist of the Iapetos Terrane (Rodgers 1985), formed during the Ordovician period of the Palezoic age about 505 to 440 million years ago. The bedrock consists of gray, medium-grained schist and granofèls. The surficial geology is a mixture of alternating layers of gravel and sand, ranging from 25 to 50 percent gravel particles to 50 to 75 percent sand particles (Stone et al. 1992). Bedrock is expected to be found at depths greater than 13 feet.

<u>Devon Compressor Station</u>

Iroquois proposes to construct the Devon Compressor Station and associated facilities in the City of Milford, Connecticut. The proposed project area is located in the Western Uplands section of the New England physiographic province. The project area has been extensively altered by past clearing and grading activities and has a nearly level topography. The approximate elevation in the project area is 40 feet, but landscapes becomes steeper west of the site. Bedrock underlying the site is Oronque Schist of the Iapetos Terrane (Rodgers 1985), formed during the Ordovician period of the Palezoic age. The bedrock consists of gray to silver, medium- to fine-grained schist and granofels. The surficial geology is a mixture of alternating layers of gravel and sand, ranging from 25 to 50 percent gravel particles to 50 to 75 percent sand particles (Stone et al. 1992). Drilling logs suggest that surficial deposits are till and stratified deposits composed of mixtures of gravel, sand, silt, and clay.

Dover Compressor Station

Iroquois proposes to install a discharge gas cooler at its Dover Compressor Station in the Town of Dover, Dutchess County, New York. The compressor station is located in the New England physiographic province, a hilly area containing remnants of the Taconic Mountains. Bedrock in the project area is more than 5 feet in depth and composed of the Wappinger Group, an elongated sequence of carbonate rocks ranging from limestone to dolomite that was metamorphosed into marble (Fisher et al. 1970). Elevations at the site range from 400 to 460 feet. Surficial geology consists of stratified glacial sand and gravel deposits ranging in thickness from 6 to 75 feet.

3.1.1.2 Environmental Consequences

Since the Geophysical Pipeline Route Survey (Thales 2001) of the proposed offshore route found that bottom and shallow subsurface sediments consisted primarily of silty clays and sand, ranging in thickness from 15 to 32 feet, no offshore blasting is anticipated. Iroquois proposes to use plowing techniques to install the pipeline, which would have no impact on the geologic structures underlying Long Island Sound.

The proposed pipeline route would cross the Harbor Hill moraine where the pipeline alignment comes ashore onto Long Island to Route 25 A, and the Ronkonkoma moraine by the William Floyd Parkway/Long Island Expressway interchange. Blasting for the onshore installation of the pipeline is not anticipated because depth to bedrock ranges from approximately 400 to 2,200 feet in Suffolk County (SCS 1987) and no rock outcrops were observed during field surveys of the proposed route. Therefore, there would be no impacts to onshore geologic structures from the proposed project.

Bedrock depth in the project area for the proposed Devon Compressor Station in Milford is not known. If bedrock is encountered during construction of the compressor station, Iroquois would attempt to break up the rock using standard construction equipment. Only if these methods fail, would blasting be used. If not properly controlled, blasting can cause damage to structures, pipeline and other utilities. Temporary effects of blasting could include hazards posed by uncontrolled flying pieces of rock, nuisances caused by noise, and fugitive dust emissions. Proper use of blast matting and time-delayed charges would minimize potential fly-rock hazards. Blasting activities would be performed by a licensed blasting contractor and would strictly adhere to all local, state, and Federal regulations applying to controlled blasting and blast vibration limits with regard to structure and underground utilities.

Given that surficial deposits are greater than the trenching depth, blasting would not be required for the proposed modifications to the Brookfield Compressor Station or the installation of the gas cooler facility at the Dover Compressor Station.

3.1.2 Mineral and Paleontological Resources

3.1.2.1 Existing Environment

There are 10 active, sand and gravel mines and one proposed mine in the vicinity of the proposed project area, but none are located within 0.25 miles of the proposed project area. Mining is not compatible with land uses in most of the project area.

The entire Brookfield Compressor Station site has been previously excavated and/or used for gravel processing/asphalt production operations (ENSR 2000). Currently there is no active or planned mining activity at the site. The Devon Compressor Station project area is not currently being mined. There is an active sand and gravel mine in the Dover Compressor Station project area; however, the proposed gas cooler facility would not be located in the area currently being mined.

The underlying bedrock along the proposed project area consists of sandstones and shales formed during the Triassic and Juriassic periods of the Mesozoic era. Paleontological resources are often associated with these formations, but in the project area are likely to be at depths well below ground surface such that these resources would not be impacted by proposed construction activities. The bedrock underlying the Brookfield Compressor Station and Dover Compressor Station project areas was formed during the Ordovician period of the Paleozoic age and is unlikely to contain significant paleontological resources. The bedrock at the proposed site for the Devon Compressor Station is comprised of metamorphosed bedrock and is not expected to contain paleontological resources.

3.1.2.2 Environmental Consequences

The Iroquois ELI Project would not occur in proximity to mineral resources and thus would not interfere with current extraction operations or limit future exploitation of mineral resources in the proposed project area. Paleontological resources in the project area are likely to be found only at depths greater than trenching depths. Therefore, pipeline and aboveground facility construction and operation is expected to have no impact on mineral and paleontological resources.

Geological Hazards

Geological hazards that can impact onshore pipeline construction and operation include earthquakes, faults, landslides, soil liquefaction, ground subsidence associated with sinkholes, and underground mines. Earthquakes, faults, and landslides are also potential hazards in the marine environment.

3.1.3.1 Existing Environment

Faults and Earthquakes

Earthquake activity is quite common in many areas of the eastern United States, including New England. The historical record of earthquakes in the northeastern United States goes back to the 1500s, and a number of seismographs were operating in this region beginning in the early 1900s. Routine reporting of instrumental data on earthquakes in this region began in the late 1930s.

Based on review of geologic maps for the project area, the Iroquois ELI Project does not cross any mapped faults on Long Island, New York. However, detailed investigations have not been completed because of the great depth to bedrock on Long Island.

A search of the USGS earthquake database found that 161 recorded earthquakes have occurred in the project area since 1534. Of the total, 28 earthquakes had a Modified Mercalli Intensity (MMI) of V or greater with a maximum intensity of VII on two records. Additionally, when searched by earthquake magnitude, with the exception of one recorded event, all earthquakes in the search area were less than a magnitude of 4 on the Richter scale. An explanation of intensities and magnitudes are provided in tables 3.1.3-1 and 3.1.3-2.

TABLE 3.1.3-1
Modified Mercalli Intensity

Value	Abbreviated Description
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rock noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

TABLE 3.1.3-2
Richter Magnitude

Richter Magnitude	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to approximately 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

To quantify seismic hazards in any given region, the USGS has developed maps of earthquake shaking hazards (USGS 1997a). Under the National Seismic Hazard Mapping Project, seismic hazard maps were updated in 1996. These maps are used to assess probabilistic seismicity and provide information used to create and update design provisions of building codes in the United States. The codes provide design standards for buildings, bridges, highways, and utilities such as natural gas pipelines. Values on these seismic hazard maps are called peak acceleration values and are expressed as a percentage of gravitational acceleration (acceleration of a falling object due to gravity). The higher the value, the greater the potential hazard.

For the project area in New York and at the three aboveground facilities, peak acceleration (levels of horizontal shaking) is not expected to be more than 3 percent of gravity, with a 1 in 10 chance of being exceeded in 50 years. This compares to values of 100 percent or more for areas in California. Based on seismic activity studies in California, 10 percent of gravity is the approximate threshold value for damage and generally corresponds to MMIs of VI to VII.

There is a thrust fault just north of the Dover Compressor Station site, but no known faults underlying the proposed project site. No significant movement is expected along this fault.

Soil Liquefaction

Soil liquefaction is a phenomenon caused by cyclic shaking of the ground and is typically associated with strong earthquakes. The phenomenon results when increased soil pore pressures approach the ambient external stress. When this condition occurs, the effective stress becomes almost zero, causing the soils to become liquefied. Soil liquefaction can result in surface settlement where the ground surface is flat or soil flow/slope instability where the ground surface is sloped. The potential for soil liquefaction is greatest in saturated fine to medium-grained sandy sediments in a fairly loose to medium state of density.

Landslides

The term landslide includes a wide range of slope failures or ground movement such as deep failure of slopes, shallow debris flows, and rock falls. In general, the risk of slope failures increases as slopes increase and soil particle sizes decrease. Although gravity acting on a naturally or artificially occurring slope is the primary reason for a landslide, there are other contributing factors including: rock and soil slopes weakened through saturation by snowmelt or heavy rains; vibrations from machinery, traffic, blasting, and thunder; excess weight from accumulation of rain or snow, or stockpiling of earthen materials such as rock or ore. In addition, earthquakes can create stresses that make weak slopes fail. The north shore of Long Island has been identified as an area of moderate landslide susceptibility in which landslides have been known to occur in less than 1.5 to 15 percent of the area.

Subsidence

Subsidence, as a result of karst terrain or underground mining, is not expected to occur along the pipeline route. Underground mining is not known to occur within the project area and the geologic conditions necessary for karst development near surface carbonate rock do not exist.

Marine Environment

Iroquois conducted a geophysical survey which included full coverage swath and single beam bathymetry, side-scan sonar imaging, sub-bottom profiling, and magnetometer readings to characterize the sea floor and underlying shallow stratigraphy along the pipeline corridor across the Sound. Data collected indicate that the sea floor over the vast majority of the proposed route is relatively featureless and flat. No areas of potential hazard were identified along the proposed route.

3.1.3.2 Environmental Consequences

The seismic performance of natural gas pipelines in southern California was reviewed by O'Rourke and Palmer (O'Rourke and Palmer 1994). The authors found that electric arc-welded pipelines constructed post-World War II that are in good repair have never experienced a break or leak as a result of traveling ground waves or permanent ground deformation during a southern California earthquake. The authors further concluded that modern electric arc-welded gas pipelines in good repair are generally highly resistant to traveling ground wave effects and moderate amounts of permanent deformation.

The potential for ground accelerations with a magnitude greater than 3 percent of gravity is low in the project area. This acceleration rate is a third of the 10 percent of gravity acceleration rate at which earthquakes in California are considered damaging. Therefore, the risk of potential damage to the pipeline from seismic ground accelerations would be minimal.

Types of sediment susceptible to soil liquefaction are not commonly found along the proposed route. Although soils subject to liquefaction may exist in areas along the pipeline route, there is little potential for liquefaction because the likelihood of a severe earthquake is low.

Since there would be no work activities in steeply sloping areas to destabilize the rock and soil slopes, and the project area has been identified as having a low landslide incidence (Godt 1997), landslide hazards in the project area would be low.

Marine Geologic Hazards

Mass movements of sediment can result from pipeline construction. Slumping or sliding of sediments can also result in displacement, rupture, or total destruction of the pipeline. However, mass movements of sediments are usually limited to areas of the continental slope and submarine canyons. Due to the gently sloping nature of the vast majority of the sea floor along each of the proposed and optional routes, the risk of causing or being affected by marine landslides is considered negligible.

3.2 SOILS

3.2.1 Existing Environment

Soil information for the onshore portion of the proposed pipeline and aboveground facilities was obtained from the Natural Resource Conservation Service (NRCS), the Suffolk County Soil and Water Conservation District, and field surveys.

Soil Types

The majority of the New York soils are formed in glacial outwash and till deposits. Most of the soils are deep and are moderately coarse textured to coarse textured. The proposed pipeline would cross 18 soil mapping units comprising the following associations: Haven-Riverhead, Plymouth-Carver, Carver-Plymouth-Riverhead, and Riverhead-Plymouth-Carver. The Riverhead and Haven soils are on remnant beach ridges and outwash plains underlain by sand and gravel deposits. These well-drained soils are on nearly level to gently sloping terrain. The excessively-drained Carver and Plymouth soils occur on sandy outwash plains, but occupy the steeper areas. Carver soils are similar to Plymouth soils with the exception of their distinctive gray or light gray subsurface layer.

Atsion Sand (At) soils, are poorly-drained soils usually found near ponds and creeks, and are considered hydric soil in Suffolk County. At soil is located in the wetland areas of the Carmans River along the proposed pipeline route (MP 27.6). Dune land (Du) soils are crossed south of the beach in Shoreham, New York (MP 17.1 to 17.2). Du soils consist of mounds of small hills of sand with no soil horizon.

Agricultural Soils

Prime Farmland

The U.S. Department of Agriculture (USDA) defines prime farmland soils as soils best suited for production of food, feed, forage, fiber, and oilseed crops. Prime farmland soils generate the highest yields with the smallest expenditures of resources. Prime farmland soils can include either actively cultivated land or land that is currently not cultivated, but is readily available for cultivation. For example, soils currently occupied by pastures, forest, and open land can be classified as prime farmland, but residential areas, commercial/industrial developments, or open water cannot. Some land may be cultivated, but may not be considered prime farmland because its soils may not be best suited for agricultural production. Prime farmland soils and soils of statewide importance are found along sections of the proposed pipeline route.

Drain Tiles

Drain tiles are used to remove excess water from the top 3 to 4 feet of soil, discharge it from the area being drained, and to improve the potential for the growth of crop plants. Construction activities, particularly trenching and heavy equipment traffic, could damage or displace existing drain tiles and affect crop yields and timely cultivation. No drain tiles have been found along the proposed project route.

Muck Soils

Muck soils are defined by the USDA as soils made up of relatively deep organic deposits, consisting of partly or almost completely decomposed plant material, that have developed in very poorly-drained regimes. Muck soil is made up of 16 to 48 inches of spongy, black or dark-reddish organic material over loose sand and gravel. The amount of partly decayed plants in the organic layer varies. Almost all of the muck soils are found with marsh grass vegetative cover types as these soils have moderate productivity for woodland use and are poorly suited to tree growth. Although occasionally muck soils are cleared and drained and used for vegetable farming, or are filled and are present in community developments, these soils are generally not suitable for engineering purposes. Muck soils are highly compressible, have an almost complete lack of strength, have a potential for flooding or ponding, and are generally too wet to be suited for cultivated crops unless they are drained.

Muck soils were found at MP 27.4 to 27.6 and are associated with the wetland areas of the Carmans River and are adjacent to Atsion Sand found at MP 27.6.

Aboveground Facilities

The aboveground facilities associated with the proposed project, in addition to the three compressor station sites, include one meter station at MP 29.1, one marine tap interconnection, three mainline valves, and one pig receiver facility. Modifications and construction are proposed at the Brookfield and Dover Compressor Stations and a new compressor station would be constructed in Dover, New York. Soil information for these facilities were obtained from the soil surveys and field surveys.

Soil mapping shows that the aboveground facilities associated with the ELI Project are underlain by Plymouth loamy sand (PlA and PlB) and Riverhead sandy loam (RdA) soils with 0 to 3 percent slopes (SCS 1975). The Plymouth series are very deep, excessively-drained, coarse textured soils found mainly on outwash plains, flat hilltops, and in drainageways or morainic deposits. They are formed in a mantle of loamy sand or sand over thick layers of stratified coarse sand and gravel. RdA soils are deep, well-drained, moderately coarse textured soils and are generally found on gently sloping areas on outwash plains and on rolling to steep areas on moraines. These soils have a slight to moderately severe erosion hazard and are considered prime farmland soils in Suffolk County.

The proposed meter station is underlain primarily by RdA soils, which comprises approximately 2.8 acres of the site, and PlA soils which account for 0.9 acres. At about MP 17.5, MLV-2 is underlain by PlB soils. The soils underlying the location of MLV-3 and 4, located at approximately MPs 22.7 and 29.1, are primarily PlA soils. The soils underlying the pig receiver facility located at the meter station are PlA soils.

<u>Brookfield Compressor Station</u>

The Soils Survey for Fairfield County, Connecticut (SCS 1981) has identified the soils underlying the 3.8-acre project area as Pits, gravel (Ps) soils. Ps soils consists of areas that have been excavated for sand and gravel. These soils have a rapid or very rapid permeability and high erosion potential when exposed or disturbed (DeRisi 2001). No soils classified as prime farmland soils or of soils statewide importance has been identified in the Brookfield Compressor Station project area.

Devon Compressor Station

The Soil Survey of New Haven County (SCS 1979) has identified the soils underlying the proposed Devon Compressor Station as Udorthents, smooth (Ud) soils. These soils are characterized as having slow to very rapid permeability, and sandy loam to silt loam or gravelly analogs texture. They are found in areas that are well-drained or excessively-drained where at least 20 inches of the topsoil or subsoil has been removed and/or placed on the ground surface. Ud soils are not classified as prime farmland soils or soils of statewide importance. Approximately 0.55 acres of Ud soils would be permanently disturbed with the construction of the Devon Compressor Station.

Dover Compressor Station

The soil mapping of the 8.1-acre project area has identified two dominant soil types: Pits, gravel (Ps) and Copake gravelly silt loam with 0 to 2 percent slope (CuA). The portion of the site containing Ps soils were previously excavated for sand and gravel and is nearly level. The proposed project area would occupy 4.8 acres of Ps soils of which 0.5 acres would contain the proposed gas cooler facility.

CuA soils are classified as prime farmland soils. Construction of the compressor station would temporarily impact approximately 3.3 acres of CuA soils. The portions of the proposed site with this soil type would be primarily temporary workspace areas. CuA soils are very deep, well-drained soils composed of gravelly loam over sand and gravel. These soils have moderate or moderately rapid permeability in solum and very rapid permeability in substratum. No soils of statewide importance have been identified on the Dover Compressor Station site.

3.2.2 Environmental Consequences

Pipeline construction activities that have the potential to adversely affect soils are primarily clearing, grading, trenching, and backfilling. Potential effects on soils include erosion due to the action of water and wind, especially on steep slopes and on non-cohesive soils, reduction of soil productivity by mixing topsoil with subsoil or by introducing subsurface rock, soil compaction and rutting due to heavy equipment traffic during wet soil conditions, encountering subsurface water, and poor revegetation.

The impact of construction on soils can be effectively reduced through the use of appropriate erosion control, construction mitigation measures, and revegetation plans. Iroquois would implement, without modification, FERC's Plan to minimize the potential for impacts to soils. Minimizing these potential impacts maximizes the chances of successful revegetation. In addition, erosion and sediment control permits required by the respective states would be filed with the Commission and Iroquois would employ environmental inspectors to monitor construction activities and ensure that adverse effects on soils are minimized. Potential impacts to soil resources and specific mitigation measures are discussed below.

Erosion

Erosion is the natural detachment and movement of soils which leads to changes in composition and loss of soil productivity. The erosion potential of soil is determined by several characteristics, including soil texture, surface roughness, vegetative cover, slope length, slope steepness, land use, and climate. Water and wind are the primary forces that cause soil erosion.

Water erosion occurs primarily on loose, bare soils located on moderate to steep slopes particularly during high intensity storm events when erosive runoff typically occurs. Wind-induced erosion often occurs on dry, fine-textured soils where vegetative cover is sparse and strong winds are prevalent.

The erosion hazard for soils in the project area are shown in table 3.2.2-1. Only Carver and Plymouth sands (CpE), Plymouth loamy sands (PlC) and Riverhead sandy loams (RdC) have slopes of 8 percent or greater and are at risk for severe erosion. However, these soils only account for 6, 5, and 3 percent of the soils along the proposed pipeline route, respectively. Iroquois would minimize erosion of soils by implementing the mitigation measures specified in FERC's Plan, some of which are discussed below.

Temporary Slope Breakers and Sediment Barriers

During construction, Iroquois would construct and maintain temporary slope breakers according to specifications in FERC's Plan. These slope breakers would be constructed across the full construction right-of-way width in order to slow the velocity of runoff and divert it off of the exposed construction right-of-way. Velocity reduction would be accomplished by spacing the slope breakers along the construction right-of-way so that the slope lengths upon which runoff can pickup velocity are shortened.

Temporary slope breakers would be constructed using a combination of slightly compacted soil berms, staked hay bales and silt fences. The runoff collected by the slope breakers would be directed off of the construction right-of-way where there is full vegetative cover or to an energy dissipation device constructed at the end of the slope breaker just outside the construction right-of-way.

Iroquois would install temporary sediment barriers at the base of slopes adjacent to road crossings and at waterbody and wetland crossings in order to reduce sediments originating from the construction right-of-way from entering these areas. Sediment barriers would consist of silt fence, staked straw bales, or sandbags and would not be removed until permanent restoration measures are successful or until the adjacent upland areas are stabilized.

Trench Breakers

During construction, Iroquois would use temporary trench plugs as needed to reduce erosion and sedimentation in the trench, minimize dewatering activities at the base of slopes where sensitive features such as waterbodies and wetlands are often located, and provide access across the right-of-way. Temporary trench plugs would consist of either compacted subsoil placed across the trench (soft plug), or unexcavated portions of the trench (hard plug). Iroquois would not use topsoil for construction of temporary trench plugs and would coordinate with landowners to identify suitable locations for the placement of hard trench plugs for access across the right-of-way.

To minimize subsurface water flow and erosion along the trench after construction, permanent trench breakers consisting of sacks of soil, sand, or polystyrene foam would be installed around the pipe prior to backfilling on slopes greater than 5 percent. An engineer or similarly qualified professional would determine the need for and spacing of trench breakers. Otherwise, trench breakers would be installed at the same spacing as, and up slope of, permanent slope breakers. In addition, permanent trench breakers would be installed at the base of slopes adjacent to waterbodies and wetlands.

TABLE 3.2.2-1

Characteristics of Soil Types Along the ELI Project

Soil Name	Map Unit	Slope (%)	Depth to Seasonal High Water Table (Feet)	Revegetation Potential a/	Erosion Hazard	Area of Impact (acres) b/
Atsion sand	At		½- 1½	2	Slight	0.2
Beaches	Bc		NA	NA	NA	2.1
Carver and Plymouth Sand	CpA		>4	3	Slight	2.6
	CpC		>4	3	Slight to Moderate	4.8
	CpE	15-35	>4	3	Moderate to Severe	17.0
Duneland	Du	1-35	NA	NA	NA	1.1
Escarpments	Es	>35	NA	NA	NA	0.3
Haven loam	HaA	0-2	>4	>4	Slight	22.3
	HaB	2-6	>4	>4	Slight to Moderate	2.8
Muck	Mu	0-3	NA	NA	NA	1.8
Plymouth loamy sand	PlA	0-3	>4	>4	Slight	18.8
	PlB	3-8	>4	>4	Slight	10.5
	PlC	8-15	>4	>4	Moderate to Severe	10.1
Recharge Basin	Rc	NA	NA	NA	NA	0.5
Riverhead sandy loam	RdA	0-3	>4	>4	Slight	24.7
	RdB	3-8	>4	>4	Moderate to Slight	12.8
	RdC	8-15	>4	>4	Moderately Severe	3.3
Riverhead and Haven soils, graded	RhB	0-8	NA	NA	NA	1.2

NA = Not available
a/ = 1- well suited; 2-suited; 3- poorly suited; 4-unsuited
b/ - Area calculated for pipeline facility

Seeding and Revegetation

Site preparation activities prior to construction of the proposed project would result in the temporary removal of existing vegetation in the project area. Vegetation is important in controlling erosion due to wind and water. Table 3.2.2-1 shows the re-vegetation potential in proposed project area, which is based on the ability of grasses and legumes in upland areas and wetland plants in wetlands to become easily established without much management. Iroquois would minimize the time that soils are exposed to wind and water by restoring vegetative cover in accordance with both FERC's Plan and Procedures and the seed mix specifications provided in New York's *Conservation Plantings on Critical Areas for New York*, and as required by applicable agencies.

Iroquois has contacted the state and/or area level offices of the NRCS and would follow seed mix specifications recommended by the Fairfield County Soil and Water Conservation District at the Brookfield Site; the *Connecticut Guidelines for Soil Erosion and Sediment Control* for the Devon Site; and the *Conservation Plantings on Critical Areas for New York* for the Dover Site.

Compaction/Soil Infertility

Soil compaction modifies the structure and reduces the porosity and moisture holding capacity of the soil. Factors important to root health and plant growth such as porosity, infiltration and aeration would be adversely impacted by compaction. Loss of soil fertility can result from construction disturbances such as soil rutting which mix upper and lower soil layers. Soil compaction and rutting reduce soil productivity, but could be mitigated by using topsoil segregation, decompaction operations, and clearing rock from the soil surface.

Compaction-prone soils are somewhat poorly-drained to very poorly-drained with high moisture content. Soil compaction may also occur in soils with high organic content such as mucky wetland soils or clay soils. Soils with a mean high water table of 1.5 feet or less with a sandy clay loam or finer texture are likely to be susceptible to compaction. Table 3.2.2-1 shows the depth to seasonal high water table along the project route.

Based on the soil types along the proposed pipeline route, the potential for soil compaction is low. The only soil type along the proposed pipeline route with the potential for compaction is muck soil. Muck soils on the proposed route are found in the Carmans River wetlands system. Iroquois proposes HDD in crossing the Carmans River which would reduce the potential for soil compaction and rutting. Iroquois would follow the soil compaction testing and decompaction mitigation measures in FERC's Plan and Procedures during construction of the proposed ELI project.

<u>Topsoil Segregation</u>

Mixing of soil horizons during construction could adversely affect productivity of agricultural soils and reduce the revegetation success of residential land by diluting the favorable physical and chemical properties of the topsoil with the less productive subsoil. Use of topsoil conservation procedures as specified in FERC's Plan and Procedures would minimize damage to the integrity of soils during construction and aid in revegetation of the right-of-way. During construction, Iroquois would segregate topsoil in all residential areas and where the construction right-of-way is wider than 30 feet in annually cultivated or rotated agricultural lands (except pasture), hayfields, and other areas at the landowner's request. As an alternative to topsoil segregation, Iroquois may replace (i.e., import) topsoil if approved by the landowner.

Iroquois proposes to open cut the Shoreham, New York landfall at MP 17.1 on a sandy beach. Topsoil in this area is sand or a mix of sand and gravel with no horizon, which may contain seeds or plant propogules that could help in beach restoration. Iroquois proposes to strip and segregate the upper 8 to 12 inches of soil from the subsoil in accordance with FERC's Plan and Procedures. If the open cut landfall is not used, Iroquois would evaluate the need to strip the upper soil layer.

Iroquois proposes to prepare a site-specific restoration plan in consultation with the NYSDEC and local soil conservation offices if the landfall is open cut. The plan would include temporary erosion control measures such as snow fencing or salt straw mulch, and permanent erosion control measures such as site recontouring and redistribution of the segregated upper soil layer. Restoration of beach grasses may require hand planting and appropriate grass seeds. If the open cut landfall is not used, Iroquois would evaluate the site restoration needs.

Introduction of Rock Into Topsoil

Grading, trenching, and backfilling could bring rocks to the soil surface that could interfere with tilling, planting and harvesting, or result in damage to agricultural equipment. Because the depth to bedrock in the project area is greater than 5 feet, the introduction of rock into the topsoil is not anticipated. Iroquois will follow mitigation measures in the FERC Plan and Procedures during construction of the proposed ELI Project, which include measures to reduce rock contamination in the event that rock excavation or blasting is required.

Muck Soils/High Water Table

Muck soils would be disturbed by the proposed pipeline from MP 27.4 to 27.6. No muck soils have been identified along the pipeline route that are used in the production of sod or any other speciality crops. HDD would be used to cross the Carmans River, thus minimizing the impact on muck soils.

Table 3.2.2-1 shows the depth to seasonal high water table along the project route. Sections of proposed pipeline route may have seasonal mean high water tables less than 5 feet from the ground surface which may affect safety and trenching activities. Trench dewatering would be conducted in accordance with FERC's Plan and Procedures.

Agricultural Soils

Prime Farmland

Iroquois has indicated that the pipeline would traverse approximately 6.7 miles of prime farmland and 3.3 miles of soils of statewide importance. Assuming a construction ROW of 75 feet, approximately 61 acres of prime farmland soils and 30 acres of soils of statewide importance would also be disturbed. No land under the NRCS Conservation Reserve Program has been identified along the proposed pipeline route.

Drainage Tiles

No drainage tiles were found during correspondence with landowner and environmental field surveys of the proposed pipeline route. However, should drainage tiles be found during construction, Iroquois would repair or replace them in accordance with FERC's Plan and Procedures. No filter-covered drainage tiles will be used unless the local soil conservation authorities and the landowner agree.

Contaminated Soils

Eight contaminated sites or landfills have been identified in the vicinity of the project area (see table 3.8.3-3). The closest site is 0.34 mi (1,800 ft) south of the proposed route, at MP 27.1. Given the distance of these sites from the proposed route, the potential for encountering and disturbing contaminated soil is minimal.

Aboveground Facilities

Since most of the areas of the proposed project aboveground facilities would not be subject to significant ground disturbances, there would be minimal impact on soils. To reduce erosion, Iroquois would implement erosion control and mitigation measures as outlined in FERC's Plan and Procedures and follow re-vegetation guidance in New York's *Conservation Plantings on Critical Areas for New York.*

Brookfield Compressor Station

There would be minimal impact to soils at the Brookfield Compressor Station project site for the proposed construction of gas filtration system and gas meter station. Iroquois proposes to adhere to erosion control, dewatering, site stabilization and re-vegetations standards in FERC's Plan and Procedures as well as seed mix specifications recommended by the Fairfield County Soil and Water Conservation District.

Devon Compressor Station

There would be minimal impact to soils and low erosion potential at the proposed Devon Compressor Station site. Iroquois proposes to adhere to erosion control, dewatering, site stabilization and re-vegetations standards in FERC's Plan and Procedures, and follow re-vegetation guidance in *Connecticut Guidelines for Soil Erosion and Sediment Control.*

Dover Compressor Station

Since most of the proposed project area for the Dover Compressor Station would not be subject to significant ground disturbances, there would be minimal impact on soils. Iroquois would adhere to erosion control, dewatering, site stabilization, and revegetation standards set forth in FERC's Plan and Procedures, and follow the seed mix specifications in New York's *Conservation Plantings on Critical Areas for New York.*

WATER RESOURCES

3.3.1 Groundwater

Groundwater use, quality, and availability vary throughout the project area. In Connecticut and New York, approximately one-third of the population relies on groundwater as its source of drinking water. In most of the project area, natural groundwater is suitable for drinking as well as other purposes, but the quality of the water differs among aquifers as a result of naturally occurring conditions and local human activity (USGS 1995).

3.3.1.1 Existing Environment

Groundwater Quality and Quantity

<u>Connecticut</u>

In Connecticut, the Brookfield Compressor Station and the project area for the new Devon Compressor Station is not located over a primary, principal or sole source aquifer (USEPA 2001a and 2001b). The project is underlain by glacial till and stratified drift composed of gravel, sand, silt and clay typically capable of yielding low to moderate amounts of water (1 to 100 gallons per minute) to individual wells (Meade 1978). The Primary Recharge Zone of the Town of Brookfield Aquifer Protection District underlies the project area for the modification of the compressor unit at the Brookfield Compressor Station (Carroccio-Covill & Associates, Inc. 2000).

The Dover Compressor Station is located over the Valley Bottom Principal aquifer system, specifically within the recharge area. This aquifer system is composed of thick glacial deposits of sand and gravel underlying marble bedrock (Iroquois 2001e). The region of the aquifer system underlying the project serves public water supply wells, although it has become threatened from urban land uses that present significant groundwater contamination risks (Horsley Witten, Inc. and University of New Hampshire 1992).

Water quality in the sandstone aquifer is suitable as drinking water and most other uses, but is locally hard to excessively hard. High chloride, calcium, and sulfate concentrations are present, and originate from the dissolution of gypsum that is naturally present in the sandstone.

<u>New York</u>

In New York, the project area lies within the Nassau-Suffolk Aquifer System (USEPA 2001a). This aquifer was formed in unconsolidated material deposited over bedrock, and consists of three distinct formations: the Upper Glacial Aquifer, the Magothy Aquifer, and the Lloyd Aquifer. The systems is regularly replenished by precipitation, which infiltrates the land surface in the Central Pine Barrens regions, enters the system through the Upper Glacial Aquifer and percolates downward to the lower Magothy and Lloyd Aquifers.

The Upper Glacial Aquifer is the uppermost unit in Long Island's groundwater reservoir (Busciolano et al. 1998). This aquifer has a thickness ranging from 200 feet to 700 feet. This aquifer system is predominately glacial outwash, composed of stratified fine to coarse sand and gravel and contains large quantities of groundwater. It is the principal source of public drinking water in eastern and central Suffolk County. The formation has a high permeability and can produce well yields in excess of 1,000 gpm without negatively affecting the surrounding water table elevation. Underlying poorly permeable layers of clays, which are characteristic of the southern shore of Long Island, are generally not present in the project area, thus allowing a hydraulic connection with the underlying Magothy Aquifer.

The Magothy Aquifer underlies most of Long Island and offshore waters, and is the primary source of water supply for the island. This aquifer's deposits are of upper Cretaceous age and consist of discontinous beds of very fine to medium sand interbedded with layers of clay and sandy clay, silt, and some coarser sand and gravel. The downward movement of water from the underlying Upper Glacial Aquifer recharges the Magothy Aquifer. The thickness of the aquifer can range up to 1,100 feet with the majority of the clay and sandy clay units in the upper part, while the coarser sands and gravel are generally in the lower 100 to 150 feet of the aquifer.

The Lloyd Aquifer (Lloyd Sand member of the Raritan Formation of upper Cretaceous age) underlies most of Long Island and offshore waters. This deposit is approximately 200 to 500 feet thick and consists of discontinuous layers of gravel, sand, sandy clay, silt, and clay. Northern parts of the Lloyd Aquifer were highly eroded during the last glacial epoch and were subsequently filled with Pleistocene-age deposits, which has hydraulically connected it with the overlying aquifers (Busciolano et al. 1998). Pre-Cambrian and Paleozoic-age bedrock consisting of crystalline metamorphic and igneous rocks underlie the Lloyd Aquifer.

The project area generally experiences good groundwater quality. Both the Upper Glacial and Magothy Aquifers continue to supply public drinking water for Central Suffolk County, including the several wells located in the project's vicinity.

Federal and State Designated Aquifers

The entire onshore portion of the pipeline route crosses the Nassau-Suffolk Aquifer System. The USEPA has designated the Nassau-Suffolk Aquifer System as a sole-source aquifer pursuant to the Federal Safe Drinking Water Act (42 USC 3000h-3.e) because there are no alternative sources of drinking water supply which could economically replace this aquifer system (USEPA 2001c). Section 1424(e) of the Safe Drinking Water Act mandates that a Federal agency may not commit funds to a project that may contaminate the aquifer through a recharge zone so as to create a significant hazard to public health. Table 3.3.1-1 identifies the Federal and state designated aquifers in the project area.

Associated with the sole source aquifer is its recharge zone, which is the area where water enters into the aquifer system. Because of groundwater movement within these aquifers, the recharge zone is considered to be all of Nassau and Suffolk Counties.

<u>Connecticut</u>

The Brookfield Compressor Station modifications would be is located within the Primary Recharge Zone of the Town of Brookfield Aquifer Protection District (Carroccio-Covill and Associates, Inc. 2000). Chapter 242-502A of the Town of Brookfield Zoning Regulations indicates that the intent of the aquifer protection district is to protect public health by preventing contamination of the ground and surface water resources providing water supply or potential water supply to the Town of Brookfield. The operation of the Brookfield compressor station with the proposed modifications is not expected to involve any of the uses prohibited by Chapter 242-502C, including the manufacture, storage, warehousing or transportation of toxic, hazardous or contaminated materials as primary activity (Iroquois 2001g).

The new Devon Compressor Station is not located over a primary, principal or sole source aquifer (USEPA 2001a and 2001b). The Devon Compressor station is located over the Valley Bottom principal aquifer system which is not a federally designated sole-source aquifers (USEPA 2000).

New York

Article 15-0514 of New York's Environmental Coservation Law (ECL) authorized the NYSDEC to promulgate rules and regulations that would restrict or prohibit incompatible uses in "primary groundwater recharge areas" (Iroquois 2001g). Primary groundwater recharge areas are those areas identified in the Long Island Comprehensive Waste Treatment Management Plan of 1978, which was developed pursuant to Section 208 of the Clean Water Act, as having hydrogeologic zones of I, II, or III. The proposed pipeline alignment from MP 18.7 to MP 26.9 crosses a Zone III (Koppelman et al. 1992). The primary groundwater recharge area, which the pipeline alignment is proposed to cross from MP 18.7 to MP 26.9 is also regulated as a Special Ground Water Protection Area (SGPA) pursuant to ECL Article 55 and is considered a Critical Environmental Area.

TABLE 3.3.1-1
Federal and State Designated Aquifers Along the ELI Project

Facility Name or MP Location	Crossing Length	Designation	Aquifer Name
CONNECTICUT			
Brookfield Compressor Station	N/A	State Designated	Primary Recharge Zone of the Town of Brookfield Aquifer Protection District[a/]
Devon Compressor Station	N/A	N/A	N/A
NEW YORK			
Dover Compressor Station	N/A	N/A	Valley Bottom principal aquifer
ELI Pipeline - MP 17.0 - 29.1	12.0 Miles	EPA Designated	Nassau-Suffolk Sole-Source Aquifer
ELI Pipeline - MP 18.7 - 26.9	8.2 Miles	State Designated	Primary Groundwater Recharge Area - Zone III[b/]
ELI Pipeline - MP 18.7 - 26.9	8.2 Miles	State Designated	Special Ground Water Protection Area (SGPA)[c/]

a/ Carroccio-Covill and Associates, Inc. 2000
b/ Identifies areas where precipitation is able to recharge the deeper aquifers and generally occurs within the interior of the island.
c/ Primary groundwater recharge area within a designated sole source area located within counties having a population of one million or more, where it is important for the maintenance of large volumes of high quality groundwater for long periods of time.

Public Water Supply Wells

Connecticut

No public drinking water supply wells or an Area of Contribution to a Public Supply Well are located withing 0.25 miles of the proposed Brookfield Compressor Station (CTDEP 2000).

The proposed Devon Compressor Station site would be located on Iroquois' existing Milford Sales Meter Station in the City of Milford in New Haven County. The South Central Connecticut Regional Water Authority (SCCRWA) supplies the drinking water in the project's vicinity (Sternberg 1986). The SCCRWA public water supply wells are located in the towns of Cheshire and Hamden (Huntley 2001). The project area is not located within 150 feet of a public drinking water supply well, or is within an area of contribution to a public supply well.

New York

Iroquois obtained information on public wells within the proposed construction ROW from reviewing well records on file at the Suffolk County Department of Health Services, Bureau of Drinking Water. Three public water supply well fields were identified within the project vicinity: the Fireman's Park, Sall Lane, and William Floyd Parkway well fields (Farmer 2001). All three public water supply well fields are located along the western side of the William Floyd Parkway. The Fireman's Park water supply well is located approximately 250 feet west of the proposed construction ROW at approximately MP 20.7 and consists of one shallow well. The William Floyd Parkway well field is located approximately at MP 25.1 and consists of three supply wells. Well Nos. 1 and 2 are completely within the Upper Glacial Aquifer and are 165 and 179 feet deep. Well No. 3 is within the Magothy Aquifer at 269 feet deep. The Sally Lane well field, located approximately at MP 22.7 is currently in the planning stages. A 7.72 acre property has been purchased, which would be the future site of this public supply well. There is currently no wellhead protection program in place for these well fields, and no wellhead protection zones have been delineated for public water supply wells in the project vicinity (Farmer 2001). No other community water supply wells have been identified within 0.5 miles of the proposed pipeline facilities.

The Dover Compressor Station is not located within 150 feet of public water supply wells, and is not located within a wellhead protection area (Dutchess County Health Department 2000). The station would be served by a private well, although the exact location of the well on the Iroquois property is not known at this time. An active drilled well is located on a residential property located west of the Iroquois property acres Dover Furnace Road. Because of the setback of the proposed gas cooler facility from Dover Furnace Road by approximately 1,000 feet, only temporary staging areas proposed in the western portion of the Iroquois property may be located within 150 feet of the private wells (Iroquois 2001e).

Private Water Supply Wells

Connecticut

Iroquois identified that the on-site well for the Brookfield Compressor Station, and one private well at a residence on High Meadow Road may be within 150 feet of the Brookfield

Compressor Station. The Devon Compressor Station project area is not located within 150 feet of a private drinking water supply well (Iroquois 2001d).

New York

Iroquois identified the presence of private wells within 150 feet of the proposed construction ROW from reviewing well records on file at the Suffolk County Department of Health Services, Bureau of Drinking Water. However, a detailed inventory of each well in the project area has not yet been completed. Therefore, **we recommend that:**

> **Before construction, Iroquois should file with the Secretary the location by milepost of all private wells within 150 feet of pipeline construction activities. Iroquois should conduct, with the well owner's permission, pre- and post-construction monitoring of well yield and water quality for these wells. Within 30 days of placing the facilities in service, Iroquois should file a report with the Secretary discussing whether any complaints were received concerning well yield or water quality, and how each incident was resolved.**

A majority of residents along the project area are serviced by municipal water systems. Private wells in the vicinity of the project would likely be used for non-drinking purposes such as irrigation (O'Brien 2001).

A portion of the proposed route would cross the Brookhaven National Laboratory (BNL) along the eastern side of the William Floyd Parkway (Iroquois 2001g). Several production wells which service the BNL are located within their property, but none are within 500 feet of the proposed ELI Project (Toscano 2001).

Contaminated Groundwater

Connecticut

It is anticipated that the Connecticut compressor station activities would not encounter significant groundwater or soil contamination. The 68.4-acre parcel, which Iroquois is planning to purchase to develop the Brookfield Compressor Station is being remedied because of solid waste disposal areas located on the property. Disposal areas identified during site investigations are expected to be cleaned up in accordance with applicable regulations before the initial construction of the compressor station. Therefore, it is not expected that groundwater and/or soil contamination would be an issue by the time that Iroquois plans to construct the station modifications (Iroquois 2001a).

Iroquois reviewed available information on the project area for the proposed Devon Compressor Station and did not find any evidence of spills or releases at the site (Iroquois 2001d). A review of USEPA hazardous site listings indicates that there are no National Priority Sites in the City of Milford (USEPA 2001d) and only one Comprehensive Environmental Response, Compensation, and Liability Information System site which is located within one mile of the project area (USEPA 2001e). This site has received a RCRA Clean Closure Certification following the cleanup of on-site contaminated material and is not expected to be a potential source of groundwater contamination.

In October 1999, ENSR conducted a Phase I environmental assessment to identify the presence, release, storage, or threat of release of any hazardous substances or petroleum products affecting the subject property. ENSR obtained state and Federal regulatory information from a database report and found that sources of contamination were not present within one-half mile of the Iroquois property.

New York

Iroquois reviewed state and Federal databases to identify contaminated sites that may be encountered during construction. The following databases and publications were reviewed: EPA National Priority List (NPL), EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), and the NYSDEC Registry of Inactive Hazardous Waste Sites. Based on the results of this query, four sites were identified within a one-mile radius of the proposed pipeline alignment which have NPL, CERCLIS, and/or Inactive Hazardous Waste Sites listings (table 3.3.1-2). The proposed alignment is generally located up-gradient of groundwater flow patterns from all four sites, therefore movement of these contaminants is not expected through the groundwater towards the project area. The Town of Brookhaven, Division of Environmental Protection (Kassner 2001) and BNL officials have also indicated that no significant contamination should be encountered during construction.

TABLE 3.3.1-2
Contaminated Sites Located Within a One-Mile Radius of the ELI Project in New York

Name of Site and Location	Approx. MP	Type of Site	Distance and Orientation from Project
Peerless Photo Products Shoreham, New York	18.7	CERCLIS NYSDEC	1.0 mile west
BNL Upton, New York	22.7 - 26.0	Superfund NYSDEC	crossed by pipeline alignment
Pecision Concepts Shirley, New York	26.0	NYSDEC	0.8 mile southeast
Yaphank Railroad Yaphank, New York	27.1	NYSDEC	0.3 south

All proposed aboveground facilities are located over the Nassau-Suffolk Aquifer System, a federal sole source aquifer. None of the aboveground facilities are proposed to be located within 150 feet of a public water supply well or within a wellhead protection area (Farmer 2001). Mainline Valve No. 3 (MP 22.7) is proposed to be located in the primary groundwater recharge area and the SGPA. None of the other aboveground facilities, including the meter station, are proposed to be located within a primary groundwater recharge area or a SGPA. None of the proposed aboveground locations are expected to contain significant groundwater contamination.

3.3.1.2 Environmental Consequences

Although construction activities associated with proposed pipeline alignment could affect groundwater resources, potential impacts would be avoided or minimized by the use of both standard and specialized construction techniques. Iroquois would implement its Spill Prevention, Containment, and Control (SPCC) Plan. The potential impacts to both shallow and deep groundwater resources from pipeline construction and operation, and Iroquois' proposed mitigation measures, are discussed below. This subsection is divided into the following topics: General Construction Procedures; Contamination of Groundwater; and Damage to Infrastructure.

General Construction Procedures

Construction and operation of the proposed ELI project is not expected to have a long-term affect on groundwater quantity or quality (Iroquois 2001g). The most significant causes of stress on the Nassau-Suffolk Aquifer System has been from increased water pumping, installation of stormwater sewers, sanitary sewers, recharge basins, and cesspools, as well as the construction of roads, parking lots, and other impervious surfaces (Busciolano et al. 1998). None of these stressors are typically associated with pipeline construction and operation. The proposed project does not involve the installation of water supply wells, should not necessitate increased water withdrawals from municipal well systems to facilitate construction, and does not entail the installation of sanitary waste disposal systems. The restoration of the project area in accordance with FERC's Plan and Procedures should restore all pre-project impervious surfaces and contours.

The construction phase of the project would involve the refueling of vehicles and storage of fuel, oil, and other fluids. Spills or leaks of hazardous liquids could potentially create a long-term contamination hazard to the aquifer system and ultimately affect its users. Long Island's groundwater reservoir is recharged solely from precipitation that infiltrates from the land surface to the Nassau-Suffolk Aquifer System. The highly permeable soils of the Central Pine Barrens, which make it a significant recharge area, also make this area especially vulnerable to the risk of pollution because its permeable soil is not readily capable of filtering or degrading contaminants.

Construction activities that could temporarily affect the aquifer system may include soil compaction and dewatering. Iroquois will follow the FERC Plan requirements to mitigate for near-surface soil compaction that would result from the movement of heavy construction vehicles. Dewatering of the pipeline trench, which may involve the installation of well points, would be the only anticipated activities requiring pumping of groundwater. This activity may be necessary in areas where the water table is high. Iroquois would perform dewatering activities in accordance with the FERC Procedures, which specifies that no heavily silt-laden water flows be discharged into any waterbody.

Contamination of Groundwater

The main potential for contamination of groundwater from the proposed pipeline project is refueling of vehicles and storage of fuel, oil, and other fluids during the construction phase. These activities could create a potential long-term contamination hazard to aquifers. Spills or leaks of hazardous liquids could contaminate groundwater and affect users of the aquifer. Soil contamination could continue to add pollutants to the groundwater long after the spill has occurred. This type of impact could be avoided or minimized by restricting the location of refueling and storage facilities and by requiring immediate cleanup in the event of a spill or leak (Iroquois 2001g).

The potential for this impact is expected to be avoided or minimized by the proper implementation of the project's SPCC Plan. Iroquois is mandated through the FERC Procedures to prepare a site-specific SPCC Plan for the proposed project that details preventative measures that shall be followed to avoid a hazardous waste spill, and mitigation measures that would be followed to immediately contain and clean up a spill, should one occur. This SPCC plan would include refueling restriction (including those specified in environmental permit conditions); designation of storage, refueling, staging, and lubrication locations prior to construction; notification procedures; cleanup and disposal actions, and contact names and telephone numbers of agencies officials that would be contacted in the event of a spill (Iroquois 2001g).

Damage to Infrastructure

Construction of natural gas pipelines has the potential to damage subsurface infrastructure, including wells. In order to mitigate any problems that may occur to the wells, **we recommend that:**

> **Iroquois should replace any potable water supply system that it damages during construction and cannot repair to its former capacity and quality. Iroquois should file a report with the Secretary identifying all potable water supply systems damaged by construction and how they were repaired.**

3.3.2 Surface Water

3.3.2.1 Existing Environment

Watershed Descriptions

The ELI Project would cross three major drainage basins, as defined by the EPA. These drainage basins are the Long Island Sound in Connecticut, and the Northern and Southern Long Island basins in New York. In addition the Brookfield, Dover, and Devon Compressor Stations in Connecticut are located within the Housatonic River drainage basin and the Tenmile River drainage basin. A description of the Sound is included in section 3.3.3.

Waterbody Classifications

The proposed project would cross two perennial waterbodies (Long Island Sound in Connecticut and New York, and the Carmans River in New York) and one intermittent waterbody, the Peconic River in New York. A description of Long Island Sound is included in section 3.3.3. Table 3.3.2-1 lists the location, waterbody name, flow regime, width, surface water and fishery classification, and the proposed crossing method for the waterbody crossings in Connecticut and New York.

TABLE 3.3.2-1
Waterbodies Crossed By the ELI Project

Mileposts	Watercourse	Flow Type	Crossing Width	Water Quality Classification	Estuarine/ Marine
0.0 to 17.1	Long Island Sound	Perennial	17.1 miles	SA[a]	Estuarine/ Marine
22.8	Peconic River	Intermittent	Culverted	C[b]	Warm Water
27.5	Carmans River	Perennial	30 feet	C(TS)[c]	Cold Water

a/ NYSDEC 1977; SA = saline surface water whose best usages are shellfishing for marketing purposes, primary and secondary contact recreation and fishing.
b/ NYCRR 6, Section 921.4; C = waters that are suitable for secondary contact recreation.
c/ NYSCRR 6, Section 922.4; TS = waters that support trout spawning.

Peconic River

The proposed pipeline route crosses the Peconic River at MP 22.8 on the eastern side of the William Floyd Parkway. The river flows in a west to east direction, beginning west of the William Floyd Parkway and emptying into Flanders Bay. The proposed construction workspace crosses the river where it is culverted alongside the William Floyd Parkway. The open channel of this river begins approximately 75 feet east of the William Floyd Parkway ROW outside of the proposed construction workspace. The open channel varies from 15-20 feet wide (top of bank to top of bank), has a sandy substrate, and its banks are approximately three feet high and nearly vertical (Iroquois 2001g).

At the time of Iroquois' field survey (August 2001), the channel was nearly dry with only several small pools of standing water. The river is presumed to be intermittent where it is crossed by the pipeline alignment serving as the headwaters for the perennial segment, which begins further to the east within the BNL property. The discharge of treated effluent from the BNL regulates to some extent the perennial flow rates experienced in the river downstream of the pipeline crossing location (Iroquois 2001).

Carmans River

The proposed pipeline route crosses the Carmans River at MP 27.5 on the southern side of the Long Island Expressway. According to field survey information, the river channel is approximately 30 feet wide (top of bank to bank), has a sandy substrate, and its banks are three feet high and nearly vertical. The Carmans River is a perennial watercourse that flows from its headwaters near Cathedral Pines Park southward into Bellport Bay, draining approximately 71 square miles. Parks are scattered along its route, with Southhaven County Park and the Wertheim National Wildlife Refuge as the largest parks along its banks. The average discharge from the Carmans River at Yapank, New York is approximately 24.5 cubic feet per second (Slack et al. 1993).

Iroquois proposes to install the pipeline beneath the Carmans River and its riparian habitat using horizontal direction drill (HDD), which is expected to avoid any surface impacts to these resources (Iroquois 2001g).

Sensitive Waterbodies

Sensitive waterbodies may include, but are not limited to, waterbodies containing habitat for threatened or endangered species or critical habitat, outstanding or exceptional quality waterbodies, waterbodies containing significant fisheries, waterbodies located in sensitive or protected watershed areas, or waterbodies listed as State or Federal Wild and Scenic Rivers.

Federal Water Programs

The proposed project area was reviewed for the following types of Federal designated sensitive surface waters: Essential Fish Habitats (EFH); Northeast Coastal Study Areas; Significant Habitats of the New York Bight Watershed; and National Wild and Scenic River System.

The MSA establishes measures to protect EFH and requires the NMFS to provide recommendations to Federal and state agencies on activities that may potentially impact EFH. The proposed pipeline alignment would cross designated EFH in Long Island Sound. We have prepared an EFH Assessment (EFHA) that describes all EFH potentially affected by the proposed alignment in Long Island Sound (see Appendix F).

In 1997, the FWS published the final draft of Significant Habitats and Habitat Complexes of the New York Bight Region. The objective of this study was to identify regionally significant habitats and species populations in the New York Bight watershed and New York, New Jersey Harbor that would provide local, state, and Federal resources agencies, planning agencies, conservation organizations, and the public with information essential to making informed land use decisions (USFWS 1997). The report emphasizes the recognition and delineation of large habitat complexes linking similar or related habitat types and local species populations into larger ecological assemblages on a landscape basis. The pipeline would cross rivers in 2 units of these complexes: the Peconic River, where it is part of the Long Island Pine Barrens-Peconic River Complex, and the Carmans River, where it is part of the Great South Bay Habitat Complex.

The proposed pipeline would not cross any part of the National Wild and Scenic River System established under the National Wild and Scenic Rivers Act (National Park Service 2001a). However, the proposed pipeline would cross a segment of the Carmans River that is listed on the Nationwide Rivers Inventory (NRI) (National Park Service 2001b). This segment is located from Long Point to the Long Island Expressway, and is on the NRI because of the recreational opportunity it provides in proximity to highly populated areas. NRI waters are identified as possible candidates for inclusion into the National Wild and Scenic River System because of their "outstandingly remarkable values," which include scenery, recreation, geology, fish, wildlife, and history. Section 5(d) of the National Wild and Scenic Rivers Act requires that "In all planning for the use and development of water and related land resources, consideration shall be given by all Federal agencies involved to potential national wild, scenic, and recreational river areas." Under a 1979 Presidential directive and related CEQ Procedures, all Federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments (National Park Service 2001c).

To date, Iroquois has not consulted with the National Park Service. Therefore, we **recommend that:**

Prior to construction, Iroquois should consult with the National Park Service to discuss the effects of its proposed pipeline in the vicinity of the Carmans River. Iroquois should file all oral and written comments it receives with the Secretary.

The project area is located outside of a 16-mile segment of the Peconic River, which is listed on the NRI. This segment is located from the Great Peconic Bay to Red Maple Swamp (NPS 2001b).

Connecticut Water Programs

The Connecticut water quality standards define a "high quality water" as "waters of a quality which exceed established standards of the respective class" (Iroquois 2001g). The Connecticut 305(b) report lists Long Island Sound as being impaired with respect to Class SA standards, and would not qualify as a high quality water.

New York Water Programs

The proposed project area was reviewed for the following types of New York designated sensitive surface waters: Significant Coastal Fish and Wildlife Habitats (SCFWH), Wildlife, Scenic and Recreation Rivers, Special Waters of Protection, and Critical Environmental Areas (CEA) (Iroquois 2001g).

The New York State Department of State (NYDOS) has designated the Carmans River as SCFWH, which the proposed pipeline alignment crosses at MP 27.5 (Iroquois 2001g). At the crossing location, the SCFWH is confined to the channel. The proposed alignment is also in proximity to the Wading River and Peconic SCFWH. As part of the policies established in New York State's Coastal Management Program (CMP), proposed activities in the coastal zone must demonstrate that SCFWH would be protected.

The proposed pipeline would cross sections of the Peconic and Carmans Rivers that the State of New York has designated as "Scenic". The intent of New York State's Wild and Scenic and Recreational River Act (ECL Article 15, Title 27) is to protect those rivers that possess outstanding scenic, ecological, recreational, historic, and scientific values. These attributes may include value derived from fish and wildlife and botanical resources, aesthetic quality, and archaeological significance. Activities proposed within a designated wild, scenic or recreational area must receive approval from the NYSDEC pursuant to 6 NYCRR Part 666.

The Carmans River is afforded special protection through 6 NYCRR Part 608 because of its C(TS) water quality standard. Proposed actions in watercourses having a water quality class or standard of AA, AA(t), A, A(t), B, B(t), or C(t) must receive a permit from the NYSDEC in accordance with 6 NYCRR Part 608. The project area does not cross any surface waters used for drinking water supply (Class AA and A), or their associated watersheds.

CEAs are defined in 6 NYCRR 617 as specific geographical areas designed by a state or local agency as having exceptional or unique environmental characteristics. Proposed actions receive more scrutiny during the State Environmental Review Quality Act review process regarding their potential affects on CEAs.

None of the CEAs in the project area specifically pertain to waterbodies. As discussed in Section 2.1.1.3, the Special Groundwater Protection Area in Brookhaven, which encompasses the Central Pine Barrens north of the Long Island Expressway, is a CEA. No other CEAs are located in the project area (Kassner 2001).

Contaminated Sediments

Iroquois reviewed available information, agency consultations, and marine surveys which indicate that construction activities should not encounter areas of significant sediment contamination. Surveys have been conducted on biological, and chemical attributes of the bottom sediments for the entire pipeline route in Long Island Sound. These results show that no sampling stations have metal or organic concentrations that exceed USEPA, CTDEP, or NYSDEC chronic limits. The NYSDEC 305(b) report and the NYSDEC 2001 Registry of Inactive Hazardous Waste Sites does not identify the Peconic River or the Carmans River as being impaired from potential contaminated sources. The Town of Brookhaven, Division of Environmental Protection has indicated that neither watercourse should have contaminated sediments at the proposed crossing locations (Kassner 2001).

3.3.2.2 Environmental Consequences

General Construction Procedures

Iroquois would construct the proposed ELI Project in accordance with the FERC's Plan and Procedures, Iroquois' SPCC Plan, and all applicable environmental permit conditions. The project's potential affects on surface water quality and its relevance to applicable water quality standards and other regulatory requirements are discussed below.

Peconic River

The Peconic River is approximately 15 to 20 feet wide at Iroquois' proposed crossing and if flowing at the time of construction, would be classified as an intermediate waterbody in accordance with Section I.C.1.b of the FERC's Procedures. Iroquois is proposing to either employ a typical bore or open cut method to install the pipe beneath the existing culvert, and would comply with our Procedures to avoid impacts to the channel and maintain water quality standards. However, the NYSDEC has indicated that it would not approve an open cut construction technique. Therefore, **we recommend that:**

> **Iroquois should install the pipeline beneath the Peconic River using the bore construction method.**

Carmans River

Iroquois is proposing to cross the Carmans River and its associated riparian habitat with a HDD from approximately MP 27.4 to MP 27.6. The total length of the HDD would be approximately 1,330 feet long. The entry and exit points and associated staging areas for the HDD would be located over 100 feet away from the river banks and any adjacent wetlands and would be restored in accordance with the FERC Plan.

For the Carmans River crossing, HDD would involve drilling of a pilot hole beneath the waterbody to the opposite bank. The hole would be enlarged with one or more passes of a reamer until the hole is the correct diameter. A prefabricated pipe segment is then pulled through the hole to complete the crossing. HDD is often considered to be a preferred crossing method for most sensitive waterbodies. However, there are still impacts that could occur as a result of the drilling, such as an inadvertent release of drilling mud. This could occur in the area of the mud pits or tank, or along the path of the drill due to unfavorable ground conditions. Drilling mud is most often comprised of naturally-occurring materials, such as bentonite, which in small quantities would not be detrimental to vegetation, fish, or wildlife. In large quantities, the release of drilling mud into a waterbody could affect fisheries and vegetation by inundating them until the mud is dispersed. However, this potential impact would usually be significantly less than those associated with an open-cut crossing.

The proposed HDD is expected to avoid surface impacts to the Carmans River and would be in attainment with New York water quality standards for C(TS) waters. Once begun, an inadvertent discharge may occur from the release of fuels or oils from construction equipment, or bentonite drilling fluids used to perform the HDD which may migrate to the ground surface and possibly into the surface water being crossed. The implementation of Iroquois' SPCC plan should minimize impacts from any such release by requiring that equipment be refueled greater than 100 feet from waterbodies and that drilling fluids be contained within the work area.

In the event the HDD fails and cannot be completed successfully, Iroquois proposes to open cut the approach along this same alignment across the Carmans River to the same tie-in point across the river. As mentioned above, the NYSDEC has indicated that it would not approve this method. Therefore, **we recommend that**:

> **In the event that the HDD under the Carmans River is unable to be successfully completed, Iroquois should not use an open cut construction method for crossing the Carmans River until it develops an open cut contingency plan, in consultation with appropriate agencies, including the COE, FWS, NPS and NYSDEC. The plan should include scaled drawings identifying all areas that would be disturbed by constructing the open cut crossing, and a description of the mitigation measures that would be used. The plan and all correspondence regarding it with these agencies should be filed with the Secretary, for review and written approval by the Director of OEP prior to construction, and at the time the contingency plan is filed with other permitting agencies.**

Contamination of Surface Water

Refueling of vehicles and storage of fuel, oil, or other fluids near surface waters may create a potential for contamination due to accidental release. Storing and refueling of construction equipment would be accomplished as far away from waterbodies as possible. The workspace near the Carmans River for the directional drill and the workspace for the shore approach in Shoreham have been located as far away from the waterbody as possible. However, equipment may need to be refueled and stored closer than 100 feet away from the waterbody depending on workspace limitations at each area. Iroquois would prepare a project specific SPCC Plan to avoid spills of fuels and hazardous materials.

Hydrostatic Testing

Iroquois would hydrostatically test the new pipeline sections prior to placing them in service to verify integrity. This test consists of pressurizing the pipeline with water and checking for pressure losses due to leakage. Hydrostatic testing would be performed in accordance with all applicable state and Federal discharge regulations.

Iroquois does not have sufficient information at this time to define the limits of the test sections. The estimated volumes required for the testing are shown on table 3.3.2-2. Iroquois would obtain the test water for the onshore segment from either the BNL's or the County's municipal water system, and it would be withdrawn at a rate agreed to by the affected party once the design data is available. These municipal water systems are supplied by groundwater and no surface water resources would be affected.

Water used for hydrostatic testing would either be returned to where it was appropriated or discharged to an approved upland site. Potential impacts resulting from the discharge of hydrostatic test waters into waterbodies could include erosion of the stream bank's soils and some subsequent degradation of water quality from increased turbidity and sedimentation.

TABLE 3.3.2-2
Hydrostatic Test Water Sources for the ELI Project

Description	Length (miles)	Test Water Volume (1,000 gal)	Water Source	Water Discharge Point
Marine Test Section	17.1	1,350	Long Island Sound	Long Island Sound
Overland Section	12.0	950	BNL's or Suffolk County's municipal water system	Returned to source or discharged to upland site

3.3.3 Long Island Sound

3.3.3.1 Existing Environment

The proposed off-shore route crosses Long Island Sound from MP 0.0 to MP 17.1. The route consists of bottom and shallow subsurface sediments consisting primarily of silty clays and sand. Sediment thickness ranges from 15 to 32 feet. Near shore, the sediment is coarser, medium grained sands. In general, the Long Island Sound is a semi-enclosed, northeast-southwest trending basin that is approximately 150 kilometers (km) long and 30 km across at its widest point, with a surface area of 3,400 square kilometers. Long Island Sound is bounded by the Connecticut mainland on the north and by Long Island on the south. A deep depression of approximately 100 to 130 feet in depth runs through the western half of the Long Island Sound. Mean water depth is about 80 feet, but can reach more than 325 feet at the eastern entrance, called the Race. The eastern end of Long Island Sound opens to the Block Island Sound at the Atlantic Ocean through several deep passages between a chain of islands that sit atop a submerged ridge. The western end is connected to New York Harbor through the East River, a narrow tidal strait. A submerged ridge near the Hells Gate bridge restricts the flow of bottom water into the East River and marks the western boundary of Long Island Sound.

The Sound has water quality characteristics at certain times of the year and in certain portions that fluctuate more extremely between estuarine conditions and marine conditions. As a generally enclosed coastal body of water, it shares some characteristics typical of other southern New England estuaries. For instance salinity can vary tremendously from strictly marine levels around 34 parts per thousand to nearly freshwater in harbors with large coastal rivers during spring snowmelt. Generally, the majority of the water volume in the Sound remains near marine conditions or slightly lower. Because the Sound has two openings instead of one, there is more through-flow of water induced by tidal forces and wind.

The Connecticut Department of Environmental Protection (CTDEP) Water Quality Standards and the New York Classes and Standards of Quality and Purity Assigned to Fresh Surface Water and Tidal Salt Waters sets forts water quality standards for their state. According to these standards, the pipeline route crosses a portion of Long Island Sound Classified as SA. Designated uses of SA waters are for marine fish, shellfish and wildlife, shellfish harvesting for direct human consumption, recreations, and all other legitimates uses including navigation (CTDEP 1997, NYSDEC 1977).

The primary water quality issue in the Sound is hypoxia, or low levels of dissolved oxygen (DO). Excess nitrogen causes the growth of phytoplankton, which sink to the bottom and decay. The decaying process consumes the scarce oxygen at the bottom. Although vertical water mass mixing is usually present, during prolonged calm periods such as late summer, deeper waters can become isolated from surface waters as a result of a sharp thermal gradient formation. Surface waters are generally oxygen-rich due to photosynthesis and wave activity. However, oxygen demand is generally greater than supply in the lower water levels, often reducing oxygen to lethal levels for fish and some benthic or bottom dwelling species. Construction has been scheduled to be outside of the most serious hypoxic conditions, which occurs during the summer in western Long Island Sound beginning west of a line from Stamford, CT to Port Jefferson, NY.

Sediment Transport in Long Island Sound

The sedimentary environments for the entire Sound basin were recently mapped (Knebel and Poppe 2000). Four primary bottom sedimentary environments were identified in the Sound: erosion or nondeposition, coarse-grained bedload transport, sediment sorting and reworking, and fine-grained deposition. The Sound primarily consists of an east-to-west decreasing gradient of tidal-current speeds coupled with the westward-directed estuarine bottom drift controlling the regional distribution of sedimentary environments. This flow regime has created a westward succession of environments beginning with erosion or nondeposition at the narrow eastern entrance to the Sound that changes to an extensive area of coarse-grained bedload transport in the East-Central Sound. This area is adjacent to a contiguous band of sediment sorted with broad areas of fine-grained deposition on the flat basin floor in the Central and Western Sound (Knebel and Poppe 2000).

Sediment profile images were successfully acquired at 48 stations along the proposed ELI route in June 2001. Three of the six images taken at each station were analyzed with ImagePro Plus software for a variety of parameters that have been found to be useful in characterizing geological and biological features of the sediment. These parameters included penetration depth, surface roughness, grain size major mode, apparent redox potential discontinuity (RPD), presence of methane bubbles, infaunal successional stage, biogenic features such as burrows and tubes, as well as physical features such as erosion and sand ripples. The survey of the ELI route shows that bottom sediments sampled, along and adjacent to the pipeline route consist predominantly of silt-clays. Very fine and fine sand dominated in some replicate samples at only 6 of the 48 stations. Four of these sandy stations were in shallow water, three near the Connecticut shore and one near the north shore of Long Island. The remaining two sandy stations were in deeper water, one just northwest of Stratford Shoals and the other in the middle of Long Island Sound close to the Connecticut-New York state line. Most stations showed near-surface textures composed of pelletal sand, derived from fecal pellets of infaunal organisms, distributed throughout the up per 2 to 3 centimeters (cm) of sediment.

High successional status, high dissolved oxygen at the sediment-water interface, and general absence of methane result in relatively unimpacted sediments. The presence of surficial pelletal sand, the absence bedding and laminations, evidence of widespread biogenic reworking of surface sediments, and the visible presence of macrofauna at all stations, collectively show intense biological activity occurring in these sediments (Iroquois 2001h).

Contaminated Sediment in Long Island Sound

Organic contaminants (e.g., pesticides, polycyclic aromatic hydrocarbons [PAHs], polychlorinated biphenyls [PCBs]) and inorganic contaminants (e.g., metals) both enter an estuarine environment from sewage outfalls, the atmosphere, and/or non-point sources. These contaminants rapidly become associated with particles through processes of chelation, adsorption, or biological uptake (Turekian et al. 1980). This water-column scavenging process is what makes an estuary an efficient trap for contaminants. Contaminants are closely associated with fine-grained organic-rich particles that have low bulk density and are therefore ultimately deposited in low kinetic areas of the bottom. This sediment focusing of muds can result in locally high concentrations of contaminants in the sedimentary record. As such, contaminant inventories in sediments reflect both long-term quality of the overlying water column and also manifest redistribution processes.

Long Island Sound has been evaluated for the apparent impact of sediment loading by dredged material disposal (Rhoads et. al 1995, USACE 1991). This analysis included separate consideration of the loading of dredged material at the point of disposal, as well as during long-term erosion, including during severe storms. The analysis suggests that metals and PCB loadings to Long Island Sound resulting from dredged material disposal are minor.

Organic and inorganic nutrients (nitrogen and phospharus in particular) are not water quality issues when plant growth is in balance with nutrient supply and grazing pressure. Nutrients become a water quality issue when the supply of nutrients is excessive, resulting in explosive blooms of algae, followed by its decay and the resulting hypoxia. One natural source of nitrogen is recycling between the estuarine seafloor and the overlying water column. This nitrogen can be acquired by plankton in surface waters or the recycled organisms may contribute to chemical and/or biological oxygen demand in bottom waters.

The natural background loadings of nitrogen in Long Island Sound are supplemented by anthropogenic sources. One confirmation of effluent input is the inventory of resting spores of the enteric bacterium *Clostridium perfringens* in sediments. This bacterium is associated with the feces of mammals and is used to track the far-field distribution of sewage-related organic matter, especially in fine-grained and organic-rich sediments.

Mapped distributions of metals in Long Island Sound show a gradient of increasing concentration from east to west. Surveys in the mid 1970s (Greig et al. 1977) and in the 1990s (Buchholtz ten brink and Mercray, in press) yielded the same results. This gradient reflects low values in eastern Long Island Sound related to the decreased input of metals in this area and the relative rare occurrence of muddy sediment near the high energy mouth of Long Island Sound (except in sediments related to the Connecticut River plume). Central Long Island Sound is dominated by muddy sediment and has concentrations of copper, selenium, and lead in the range of 10-200 micrograms/gram with local "hot spots" related to point sources. The highest values (100 to >200 micrograms/gram) are present in western Long Island Sound in muddy sediments. Sand shoals in western Long Island Sound contain lower concentrations of metals due to removal of organic fines by selective current washing. Sediments in western Long Island Sound were also examined for organic and metal consistency.

3.3.3.2 Environmental Consequences

The most significant potential impacts to water quality in the Sound from pipeline construction are from sediment resuspension/redeposition from trenching and burial of the pipeline, accidental fuel spills, and discharges of hydrostatic test water.

The construction period for the offshore portion of the proposed project is anticipated to begin in the fall of 2003 when hypoxic conditions should be decreased. Iroquois expects the offshore construction to be completed by March 1, 2004, and we believe that barring extensive weather delays, this schedule can be met. Impacts to benthic oxygen levels during construction would be minimized if this March 1, 2004, date can be met. However, if construction extends into the spring due to unexpected delays it could exacerbate hypoxic conditions.

Trenching and Pipeline Burial

Iroquois has proposed two types of offshore construction techniques (see sections 2.3 for detailed discussions of these methods): plowing (MP 0.04 to MP 16.5) in waters deeper than 25 feet and dredging at the beginning tie-in and at the landfall (MP 0.00 to 0.04 and MP 16.5 to MP 17.1). Iroquois is proposing to use the plow trenching technique in order to minimize the turbidity and sedimentation impacts associated with the offshore construction. Plowing would limit turbidity and the associated sedimentation because less sediment is released into the water column compared to other trenching methods. The trench would be plowed at a relatively slow rate on the order of 1 to 4 inches/second. This results in displacement rather than the energized removal of sediments, thereby minimizing turbidity and sedimentation impacts. In contrast, dredging causes sediment dispersal during mechanical removal (digging), and when lifting and dumping the dredge bucket.

Since plowing is the preferred installation method based on the least amount of disturbance to the bottom, the CTDEP indicated that a sediment plume analysis was not warranted at this time (Wisker 2002).

Any method used, however, would impact bottom sediments in the Sound. The impacts would be from displacement or disturbance of the sediments, and the resultant release of sediments into the water column causing increased turbidity. This re-suspension of sediments into the water column can temporarily affect water quality through the reduction of dissolved oxygen and depth of light penetration, as well as potentially releasing contaminants. Construction activities create increases in turbidity, which limits light penetration necessary for photo synthetic oxygen production. Coarse sediments generally settle quickly, whereas finer sediments remain suspended in a plume for longer periods of time. The plow technique causes minimal resuspension of sediments because sediments are displaced by mechanical action. The extent of disturbance from plowing depends on the number of passes that would be required for Iroquois to install its pipeline.

The temporary increase in turbidity is not expected to have a significant impact to Long Island Sound's water quality because the bottom of Long Island Sound is a naturally turbid environment, and its aquatic life is accustomed to this (Iroquois 2001h). The sea floor is subject to daily disturbances, particularly to organic-fine textured sediments as a result of anchoring, currents, storms, and trawling from fishing vessels. The high re-suspension rate of organic mineral aggregates in the lower half of the water column (below the pycnocline) results in a phenomenon known as the benthic turbidity zone (BTZ), which is suggested to extend over the entire silt-clay mud bottom of Long Island Sound. The BTZ is likely to be an important turbidity phenomenon along the proposed route as 87 percent of the sampling stations consist of at least 50 percent silt-clay by weight.

The proposed pipeline construction should not result in lower DO concentrations, if construction is completed in the winter months as scheduled. The project would not discharge organic contaminants into surface waters, and would not affect biological oxygen demand (BOD). Also, sampling results show that the project area does not cross buried sediments having metal or organic concentration levels that exceed Federal or state chronic limits. Significant metal or organic concentrations could have the potential of increasing BOD by oxidizing at either the sediment-water interface or overlying water column when exposed, and causing the re-deposition of particles in the form of metal oxidizes and partially oxidized organic material. However, because the buried sediments along the proposed route do not exceed state limits for metal and organic concentrations, this scenario is unlikely.

Impacts related to sediments within the Sound can be quantified in both volume (three dimensional) and area (two dimensional). The proposed construction techniques of plowing and dredging would disturb approximately 230 acres of seafloor. The volumetric displacement (in cubic yards) of sediment displaced by each method would be: dredging (22,300) and plowing (159,700). If jetting is required through a particular area, it is estimated that 2.53 cubic yards of sediment would be displaced per linear foot of trench.

For the plowed trench the average depth of spoil over the full width of the affected area has been calculated at 16.2 inches. The estimated profile of the spoil displaced from the trench indicates the spoil pile height would be approximately 3.6 feet at the edge, decreasing to zero at the furthest distance from the trench.

3.4 FISH, BENTHIC COMMUNITIES, AND WILDLIFE

3.4.1 Fisheries Resources

3.4.1.1 Affected Environment

Surface waters crossed by the ELI Project support warmwater, coldwater, diadromous (anadromous and catadromous), and marine fisheries. Representative recreational or commercially important fish species known to occur within the proposed project are listed in table 3.4.1-1.

Warmwater streams and rivers are typically slow moving, poorly oxygenated waterbodies with soft substrates of sand and silt. The only warmwater fishery stream crossed by the proposed project would be the Peconic River (MP 22.8). Largemouth bass, chain pickerel, and brown trout are important recreational species known to occur in this river (NYSDOS 1987).

TABLE 3.4.1-1
Recreational or Commercial Important Fish Species Known to Occur in the Project Area

Warmwater	Coldwater	Diadromous	Marine
Largemouth Bass	Brook Trout	Atlantic Salmon	Butterfish
Sunfish	Brown Trout	Eels	Summer Flounder
Northern Pike	Rainbow Trout	Menhaden	Silver Hake
Chain Pickerel		Smelt	Weakfish
		Shad	Winter Flounder
			Scup
			Black Sea Bass
			Striped Bass
			Bluefish
			Atlantic Mackerel
			Pollock
			Red Hake
			Windowpane
			Sturgeon
			Sandbar Shark
			Sand Tiger Shark
			American Lobster
			Crab
			Oyster
			Clam
			Conch
			Scallop
			Squid

Coldwater streams and rivers are typically fast moving, well oxygenated, low temperature waterbodies with hard substrates of gravel, cobble, or rock. The only coldwater fishery stream crossed by the Project would be the Carmans River (MP 27.5). Brook, brown and rainbow trout are important recreational coldwater species known to occur in this stream (NYDOS 1987).

Marine habitats crossed by the ELI Project include estuarine and marine intertidal, subtidal, and open water habitats. The benthic habitats crossed consist primarily of silt bottom along with areas of firm and coarse sand. These habitats support both diadromous and marine fisheries and diverse benthic communities that include various shellfish and other benthic invertebrates. See the Essential Fish Habitat Assessment with additional information on selected species with commercial and recreational value for a description of these habitats (Appendix F).

3.4.1.2 Environmental Consequences

Impacts on fishery and benthic resources as a result of pipeline construction across or adjacent to waterbodies could be caused by direct disruption of bottom sediments from trenching and associated sedimentation and turbidity; barge anchoring and cable sweep; habitat loss and/or cover loss; and other impacts including entrainment of fish during hydrostatic test water intake activities, and introduction of water pollutants or non-native species. Potential impacts to onshore fisheries are addressed below. Impacts to marine fisheries and benthic communities are discussed in the EFH Assessment (Appendix F).

Onshore

The impacts of sedimentation and turbidity at the river crossings would be avoided by tunneling under the rivers or crossing when there is no flow in the case of the intermittent Peconic River. There is not likely to be any affect to the Carmans River's fisheries due to the use of HDD. The potential impacts due to a failed HDD were discussed earlier in section 3.3.2.2. An increase in turbidity from a "frac out" of drilling muds could directly impact the gills of finfish species and sight feeding aquatic species. A release of drilling muds would result in temporary impacts as most mobile fish and aquatic species would be able to relocate to adjacent areas of suitable habitat. Iroquois would conduct geotechnical studies to evaluate the feasibility of the HDD; follow procedures in its SPCC Plan to avoid and respond to any inadvertent release of drilling muds from the HDD process; and, prepare and file contingency plans with the Secretary that would be implemented in the event that the drilled crossing is unsuccessful.

The Peconic River is culverted and intermittent at the location where Iroquois proposes to cross. Therefore, Iroquois proposes to use the conventional open cut crossing method if there is no water flow in the crossing section of the Peconic River at the time of construction. However, based on NYSDEC concerns, we have recommended that Iroquois use a bore technique to tunnel under the river. Construction across both rivers would be performed in accordance with our Procedures, the SPCC Plan, and the SWPP Plan to protect in-stream water quality and riparian habitat. This stream crossing would have no impact on Peconic River fishery resources.

The estimated volume of water needed for hydrostatic testing of the onshore portion of the pipeline is 950,000 gallons. Iroquois anticipates acquiring this water from either Brookhaven National Laboratory or the county water system. Therefore, no impacts to fish in New York Streams or rivers are expected.

Direct spills of toxic chemicals (e.g., fuels and lubricants) associated with pipeline construction into rivers or the Long Island Sound could impact fish, shellfish, and benthic macroinvertebrates. The overall impact would be dependant on the type, quantity, and concentration of hazardous material spilled. Iroquois' SPCC Plan would include refueling restrictions (including those specified in environmental permit conditions); designation of storage, refueling, staging, and lubrication locations prior to construction; notification procedures; cleanup and disposal actions; and contact names and telephone numbers of officials that would be contacted in the event of a spill. We believe that proper implementation of the SPCC Plan would avoid and minimize the affect of potential spills of toxic substances on fish, shellfish, and other macroinvertebrates.

Offshore

A complete description of the offshore existing environment and impacts to marine fisheries and benthic communities is provided in appendix F. The major impact issues, however, are coordinating the timing of construction, cable sweep impacts, and restoration of the seabed. These issues are briefly discussed below.

Marine organisms have widely varying life histories with different stages occurring at different times of the year. These include times of migration, spawning, recruitment from planktonic to benthic life stage, etc. Coordinating the timing of construction with state and Federal agencies can minimize impacts to species managed by these agencies. Iroquois proposes to install the pipeline and restore the ROW in Long Island Sound from the fall of 2003 to Winter/Spring 2003/4. However, the NMFS, CTDEP and NYSDEC have not agreed to this schedule and have not finished coordinating the proposed construction window yet. Therefore, **we recommend that:**

> **Iroquois should consult with the NMFS, CTDEP, NYSDEC, and interested organizations to develop a construction schedule that minimizes impacts on managed species of commercially and recreationally important fishery resources. All oral and written communications regarding this should be filed with the Secretary, prior to construction.**

In terms of area of impact, cable sweep would have the largest impact to the Long Island Sound seabed. Iroquois estimates that approximately 2,700 acres of seafloor would be impacted by cable sweep associated with the pipeline construction. The seabed would be disrupted over much of this area and most sessile invertebrates, some mobile invertebrates, and some demersal fish could suffer mortality. The use of mid-line buoys has been shown to significantly reduce the area of seabed impacted by cable sweep, but Iroquois has not proposed to use them, and has not yet been asked. Therefore, **we recommend that:**

> **Iroquois should use mid-line buoys on each anchor cable on all construction barges.**

After the pipeline is lowered into the trench, Iroquois proposes to allow natural sedimentation to backfill the trench from MP 0.04 to 16.5, instead of creating additional disturbance from a third pass by a bury barge. Although this would reduce the associated impacts of cable sweep, anchor scars and seabed disturbance, the pipeline trench would remain unfilled for some time and act as a barrier to migrating fish and shellfish. It has been shown that dredged pits in areas with lower current velocities can take 5 to 10 years to fill. Due to the fact that much of the offshore route is located in depositional areas with low current velocities, it is likely that some long-term seabed depressions could result from the ELI Project pipeline construction. These long lasting depressions can act as sediment traps accumulating fine sediment and organics, which can lead to anoxic sediments that develop considerably different communities from the original deposits (Hall, 1994). The persistence of these depressions would represent a long-term conversion of EFH that we believe would be a greater adverse effect than the additional effects from cable sweep, anchor scars, etc. that would occur within the same area during backfilling as they did during trenching. The cumulative effect of this during backfilling would not be significant relative to the temporal length of habitat disruption if no backfilling occurred. We believe that backfilling the trench would expedite the recovery of the benthic community along the trenched seabed and avoid-impacts to migration pathways of benthic marine organisms and therefore, **we recommend that:**

- **Iroquois should restore the seabed by backfilling the trench between MPs 0.04 and 16.5, using sea plow technology where possible, to within +/- 1 foot of the original contour.**

3.4.2 Wildlife Resources

3.4.2.1 Existing Environment

Wildlife species inhabiting the ELI Project area are those characteristic of deciduous, coniferous, and mixed forest, early successional, wetland, riparian habitat, maritime beach, and marine habitat (see sections 3.5.1 and 3.7.1 for a description of vegetative cover types and see section 3.4.1 for a description of marine habitat).

Forested habitat in the ELI Project area consists of hardwood, conifer, and mixed species stands. Representative bird species include the woodcock, ruffed grouse, wood thrush, red-eyed vireo, blue-gray gnatcatcher, Carolina wren, and eastern towhee. Typical mammals include the gray squirrel, red squirrel, eastern chipmunk, pine vole, raccoon, and white-tailed deer (USFS, 1995). Characteristic raptors include barred owl, great-horned owl, and red-shouldered and broad-winged hawks. Early succession habitat consists of livestock pastures, and existing powerline, pipeline, and roadway ROW. Typical wildlife attracted to open land and ROW habitats include mourning dove, killdeer, field sparrow, European starling, brown-headed cowbird, eastern cottontail, and red fox (USFS, 1995; Iroquois, 2001).

Wetland habitats in the ELI Project area include palustrine forested, scrub-shrub, and emergent vegetative communities. The increased availability of water in these areas provides more abundant and diverse habitat for a variety of resident and migratory wildlife species. Many wildlife species from other adjacent habitats use wetlands as a water resource; others use wetlands exclusively, and many fish, amphibians, aquatic reptiles, and some bird species are dependent on the water resource. Representative wildlife species that are highly dependent on wetlands for resting or nesting include various waterfowl, herons, shorebirds, muskrat, mink, and beaver.

Many of the wildlife species associated with wetlands use riparian corridors for foraging, nesting and breeding, and cover. Numerous wildlife species also use the vegetation and cover provided by riparian corridors for dispersal and migration. The pipeline would cross two perennial waterbodies that provide riparian corridors: the Peconic River and Carmans River. Often these riparian systems are associated with wetlands and are an integral, hydrologic component of the wetland system. Representative wildlife species in these riparian systems include ducks, geese, muskrat, mink, racoon, and beaver.

Many of the bird species potentially occurring in the ELI Project area are migratory. Migratory birds are those species that nest in the United States and Canada during the summer, then migrate south to regions of Mexico, Central and South America, and the Caribbean for the non-breeding season. Many bird species pass through the project area during migration to and from neotropical regions. Additionally, many migratory bird species (e.g., warblers, vireos, tanagers) may nest within the ELI Project area during the breeding season.

No national wildlife refuges or state wildlife management areas would be crossed by the ELI Project. However, the project would cross notable wildlife habitat, including the Central Pine Barrens and the Long Island Sound. The Central Pine Barrens in New York is comprised of mostly pitch pine woodlands, pine-oak forests, swamps, marshes, and bogs, and would be crossed by the pipeline between MPs 18.7 and 26.9 and MPs 27.1 and 27.6. Representative species that may specifically occupy the pine barrens include Fowler's toad, pine warbler, whip-poor-will, masked shrew, and eastern mole CPBJPPC, (1995; Reschke, 1990).

The Long Island Sound would be crossed by the pipeline between MPs 0.0 and 17.1. Wildlife species inhabiting the Long Island Sound in the vicinity of the ELI Project are those characteristic of maritime beach, mudflat, marsh, and marine habitats. Game and commercial finfish and shellfish known to inhabit the Long Island Sound are described in section 3.4.1 and endangered and threatened species of shorebirds and marine turtles are be described in section 3.6. Maritime beach habitat that would be crossed by the pipeline may be important nesting grounds for migratory shorebird species. Representative mudflat and marsh bird species include various gulls, plovers, sandpipers, and waterfowl. Representative pelagic and intertidal seabirds include shearwaters, petrels, northern fulmar, gannet, brown pelican, cormorant, and various waterfowl, gull, and tern species. Harbor seals and grey seals, protected under the Marine Mammal Protection Act of 1972 (Amended 1994), are marine mammals that occur regularly within the pipeline corridor. In the Long Island Sound, harbor seals occur most frequently from November through May.

3.4.2.2 Environmental Consequences

Construction and operation of the ELI Project would result in temporary and permanent alteration of wildlife habitat, as well as direct impact on wildlife such as disturbance, displacement, and mortality. The clearing of the ROW vegetation would reduce cover, nesting, and foraging habitat for some wildlife. During construction, more mobile species would be temporarily displaced from the construction ROW and surrounding areas to similar habitats nearby. Some wildlife displaced by construction would return to the newly disturbed area and adjacent, undisturbed habitats soon after completion of construction. Less mobile species, such as small mammals, reptiles, and amphibians, as well as bird nests located in the proposed ROW, could be destroyed by construction activities. Routine maintenance activities on the permanent ROW would have similar but less extensive effects on wildlife species in the area, depending on the time of year. However, the overall impact on general wildlife would be temporary and not significant due to the short duration of the activities and availability of undisturbed similar habitats adjacent to the ROW from which the affected species would return and recolonize the disturbed ROW.

In forested areas, the principal impact on wildlife would be a conversion of forest over the permanent ROW to herbaceous vegetation cover and an increase in edge habitats, and a corresponding shift in species using the ROW from those favoring forest habitats (e.g., downy woodpecker, red squirrel) to those using edge habitats and more open areas (e.g., eastern cottontail, mourning dove). Many species adapt well to this habitat reversal and take advantage of the increased herbaceous growth found in the new ROW. Predatory species such as the red-tailed hawk, coyote, and gray fox commonly use utility ROW for hunting taking advantage of the often increased small mammal populations found in open type habitats.

Although construction and operation of the ELI Project may be advantageous for some species, it would create new cleared ROW or widen existing cleared ROW, which may affect some forest interior species, or species that prefer large tracts of unbroken forest. The breeding success of some forest interior bird species (e.g., many warblers, vireos, and thrushes) has been shown to be limited by the size of available unbroken forest tracts (Robbins, 1979; Robbins et al., 1989). For these species, additional loss of forest habitat in tracts of already marginal size could further reduce breeding success. The cleared ROW may also encourage population expansion of parasitic species such as the brown-headed cowbird, and also encourage population expansion of exotic species (i.e., house sparrow, European starling) which compete with many native species. The potential for this type of impact would be greatest where the pipeline would traverse smaller, isolated woodlots (Galli et al., 1976).

Non-forested habitats that would be affected by the ELI Project include agricultural areas, non-forested wetlands, open land, and open water. The impact on these habitats and associated wildlife species would be relatively minor and short-term. The temporary alteration of these areas would not have a significant or permanent impact on their wildlife value because the habitat would be returned to previous conditions after construction.

Wetlands and riparian systems would be crossed by the ELI Project. These areas are important as year-round habitats for numerous resident wildlife species and are used seasonally as stopovers for migrating waterfowl. Disturbance to these habitats would be minimized through implementation of our Plan and Procedures. See section 3.7 for further discussion on wetland impacts.

To minimize the potential impact on migratory bird species that may use the permanent ROW for nesting, Iroquois would limit routine vegetation maintenance of the ROW to once every 3 years. However, to facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in a herbaceous state. In order to minimize disturbances to nesting birds, no routine vegetation maintenance clearing would occur between April 15 and August 1 of any year. To further reduce the impacts on migratory bird species caused by forest fragmentation, Iroquois would collocate the pipeline ROW with existing ROW to the maximum extent possible. Approximately 90 percent of the onshore pipeline alignment would be collocated with existing ROW.

Wildlife occupying the habitats associated with the Long Island Sound (e.g., open water, coastal) may be temporarily disturbed during construction, but no permanent impacts including wildlife mortality, are expected. Offshore birds, marine mammals and turtles are expected to avoid the area of impact during construction activities. Substrate disturbance may temporarily reduce prey availability near the construction corridor. However, following sediment settling the area should recolonize and return to preconstruction conditions. Overall, we believe that the ELI Project as proposed would not have a significant impact on marine wildlife.

VEGETATION

Existing Environment

Vegetation types that would be affected by the ELI Project include forest (non-agricultural wooded uplands and wetlands), open land (non-agricultural open and scrub-shrub fields and wetlands, and maritime beach), and agriculture (see tables 3.8.1-1 and 3.8.1-3). The pipeline would cross a total of about 4.4 miles of forest, 6.9 miles of open land, and 0.7 miles of agricultural land. Forested, scrub-shrub, and emergent wetland vegetation types affected by the ELI Project are characterized and addressed in section 3.7, Wetlands.

Portions of the ELI Project area would be within the eastern transitional and mixed deciduous forests and would cross three forest cover types: temperate broadleaf deciduous, coastal oak-mixed hardwood, and pitch pine-oak. Temperate broadleaf deciduous forests generally occur as isolated parcels within agricultural fields or urban areas and are dominated by trees that provide a dense, continuous canopy in summer and shed their leaves completely in the winter. Typical species include beech, sugar maple, red maple, oak, hickory, basswood, and tuliptree.

The coastal oak-mixed hardwood forest community is codominated by scrub oak, post oak, and blackjack oak, along with beech, hickory, heath, and/or laurel, and occurs on dry, well-drained, loamy or sandy soils of glacial moraines. The variable subcanopy stratum is usually comprised of small trees and tall shrubs including flowering dogwood, blueberry, and huckleberry. The sparse herbaceous layer in these communities includes Swan's sedge, Canada mayflower, white wood aster, wintergreen, and Pennsylvania sedge (Reschke 1990).

The pitch pine-oak forest community is dominated by pitch pine with one or more of scarlet oak, white oak, black oak, or red oak as codominants. The shrub layer consists of scattered clumps of scrub oak and a nearly continuous cover of huckleberry and blueberry. Bracken fern, wintergreen, and Pennsylvania sedge generally compose the sparse herbaceous layer. One report (Reschke 1990) describes small patches of grassland within shrub thickets that are scattered throughout the pitch pine-oak forest community. These grassland communities are generally dominated by big bluestem, common hairgrass, and poverty grass.

Open land consists of herbaceous species common to disturbed areas, such as little bluestem, spike grass, switchgrass, asters, goldenrods, false indigo, and sweet fern. Other native species include old-field cinquefoil, evening primrose, and ragweed. Weedy non-native species include bluegrasses, timothy, quackgrass, sweet vernal grass, orchard grass, chickweed, Queen Anne's lace, and dandelion. Characteristic woody species include red cedar, blackberry, hawthorne, choke-cherry, serviceberry, sumac, arrowwood, and multiflora rose. Diversity is generally lower in frequently mowed areas and higher at less disturbed sites. The maritime beach is a sparsely vegetated community that occurs on unstable sand shore above mean high tide, where the shore is modified by storm waves and wind. Vegetation is primarily beach grass.

Cultivated areas crossed by the pipeline in Suffolk County, New York are primarily used to grow potatoes and other vegetables, orchard products, and corn and oats for grain.

Sensitive Vegetation Communities

The pipeline would cross approximately 8.7 miles of the Long Island Central Pine Barrens. This area is a complex mosaic of pitch pine woodlands, pine-oak forests, coastal plain ponds, swamps, marshes, bogs, and streams. In the frequently burned areas, the dominant tree species is the pitch pine. Pitch pine woodlands are characterized by widely spaced pitch pine which allows abundant sunlight to penetrate the open tree canopy allowing dense growth of various shrub species. The Long Island Central Pine Barrens are managed under the Long Island Pine Barrens Protection Act which protects, preserves, and enhances the functional integrity of the Pine Barrens ecosystem resources, including plant and animal populations and communities (CPBJPPC, 1995). The management of this area is discussed in section 3.8.3.

The NYSDEC's Natural Heritage Program tracks the state's rare ecological resources, which has recorded 52 occurrences of 8 state-listed rare natural communities (S1-S3) in the Central Pine Barrens (CPBJPPC, 1995). These communities include the coastal plain pond shore (38), coastal plain pond (2), coastal plain poor fen (2), coastal plain Atlantic white cedar swamp (2), pine barrens shrub swamp (1), dwarf pine plain (1), pitch pine-oak-heath woodland (5), and salt panne (1). Of these known occurrences, almost all are within the Core Preservation Area (CPA). One occurrence of pitch pine-oak-heath woodland and six occurrences of coastal plain pond shores are in the Compatible Growth Area (CGA) (CPBJPPC, 1995).

Invasive Plants

The Invasive Plant Council of New York State (IPCNYS) created a list of the 20 most invasive species in New York (IPCNYS, 2001). Although this list does not have legal status, it is generally considered the best reference for invasive plants in the state. Of the species on the list, common reed, autumn olive, honeysuckle, Japanese stilt grass, multiflora rose, Norway maple, oriental bittersweet, and knapweed potentially occur within the ELI Project area on Long Island. These species also predominantly occupy disturbed areas including roadsides, forest edges, and wetlands or other areas of moist soils.

The Connecticut Invasive Plant Working Group (CIPWG) maintains a list of invasive or potentially invasive species in Connecticut (CIPWG, 2002). Although the list does not have legal status, species on the list that may occur within the pipeline corridor include garlic mustard, oriental bittersweet, common reed, purple loosestrife, spotted knapweed, honeysuckle, multiflora rose, buckthorn, autumn olive, black locust, Norway maple, and poison ivy. These species typically inhabit disturbed areas such as wetlands and other moist soil areas. The invasive common reed has been successful in out-competing native cordgrass in some coastal marshes. Purple loosestrife is a common invasive species in emergent wetlands in the vicinity of the ELI Project area, particularly in wetlands that have experienced past disturbance.

3.5.2 Environmental Consequences

Several commentors requested that Iroquois evaluate the impacts that the ELI Project would have on vegetation. The ELI Project would result in temporary disturbance to vegetation in Connecticut and New York during construction and, to a lesser degree, during operation and maintenance. Vegetative communities outside the maintained portions of the existing ROW include forested, open, and agricultural lands. A total of 74.5 acres of forested land, 122.7 acres of open land (including maritime beach), and 12.0 acres of agricultural land would be affected by pipeline facilities (see table 3.8.1-3). Of the 74.5 acres of forest disturbed during construction of the pipeline facilities, about 26.7 acres would be maintained in herbaceous cover and the remaining 47.8 acres would be allowed to revegetate to forest. Permanent impacts to forested areas were minimized to the maximum extent practicable by collocating 90 percent of the onshore portion of the pipeline facilities with existing ROW. Aboveground facilities would affect a total of 4.1 acres of forested land and 10.0 acres of open land. Of the 4.1 acres of forest disturbed during construction of the aboveground facilities, about 0.4 acres would be maintained in herbaceous cover and the remaining 3.7 acres would be allowed to revegetate to forest.

The primary impact on vegetation would be the temporary and permanent alteration of vegetative cover on the ROW. In all areas, the construction ROW would be cleared of vegetation, stumps, rocks, and debris and then graded where needed to create a level and safe working surface for construction equipment. Timber would be removed only within designated ROW or workspaces. Merchantable timber would be limbed, cut, and removed from ROW in some areas. Timber that is not merchantable and other vegetative debris such as stumps would be chipped or disposed of according to applicable regulations. Disposal of materials should be done in accordance with local ordinances, or at approved commercial facilities. Therefore, **we recommend that:**

> **Iroquois should consult with the appropriate state and local agencies to identify applicable regulations regarding disposal of stumps and other vegetative debris on- and off-site. All related correspondence should be filed with the Secretary before construction.**

Clearing and subsequent restoration of vegetation in the construction ROW would be performed in accordance with our Plan and Procedures. Following installation of the pipeline facilities and recontouring of the ROW, all disturbed areas would be reseeded. The rate of revegetation would depend on several factors, including local climate, soil type, vegetation maintenance practices, land use, and the existing and seeded vegetation. The amount of time required for complete recovery of the vegetation to preconstruction levels would depend on these factors, as well as the size and age of the pre-existing vegetation when cleared. All temporary work areas would be allowed to revegetate naturally to preconstruction conditions following initial erosion control seeding. The permanent ROW in upland areas would be maintained by periodically clearing woody vegetation for the life of the ELI Project.

The relative impact of clearing would be greatest in forested areas because the removal of trees would result in the greatest change in the structure and environment of the vegetative community. Moreover, the effect of clearing would be of longer duration in forested areas than in other areas (e.g., agricultural land, open land) and, in the case of maintained (permanent) ROW, would be for the life of the ELI Project. In temporary work areas where forest regeneration would be allowed following construction, the reestablishment of forest to preconstruction conditions would probably take between 25 and 150 years. In contrast, the reestablishment of old fields, pastures, and rotated croplands following construction typically would require 1 to 3 years.

Several commentors requested that Iroquois control invasive species. Under Executive Order 13112, Federal agencies whose actions may affect the status of invasive species shall not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species.

Consistent with E.O. 13112, Iroquois would adhere to our Plan and Procedures and would restore vegetative cover in the project area in accordance with the seed mixture specification provided in *New York's Conservation Plantings on Critical Areas for New York*, and as requested by the Central Pine Barrens Commission and by applicable agencies. Therefore, **we recommend that:**

- **Prior to construction, Iroquois should file with the Secretary copies of all site-specific invasive species control plans and correspondence with individuals, organizations, and agencies regarding measures to control the introduction and spread of invasive species.**

In uplands, Iroquois would conduct follow-up inspections of disturbed areas after the first and second growing seasons to evaluate the success of restoration after construction and potential establishment of invasive species. In wetlands if revegetation would be monitored for 3 years and if it is not successful at the end of 3 years, Iroquois would develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate the wetland with native vegetation. Successful restoration criteria of uplands and wetlands are based upon the restoration of vegetative cover and the establishment of native vegetation criteria outlined in our Plan and Procedures. Iroquois would prepare activity reports during these monitoring periods documenting problems identified by the company or landowner and describing corrective actions taken to remedy problems, and file these reports with the Secretary on a quarterly basis.

Site Specific Impacts

The ELI Project would involve the permanent conversion of forest habitat to open field habitat along existing maintained ROW in the U.S. Fish and Wildlife Service (FWS)-designated Long Island Pine Barrens-Peconic River Complex and the CPBJPPC-regulated Central Pine Barrens. However, the proposed project should not threaten the management objectives of the Central Pine Barrens. The Central Pine Barrens Commission (CPBC) requested that Iroquois evaluate options to minimize clearing of vegetation to the maximum extent practical in the Central Pine Barrens. For further discussion on the pipeline alignment through the Central Pine Barrens see section 3.8.3.

The project alignment does not cross any of the known occurrences of the eight state-listed rare natural communities of the Central Pine Barrens, and the change of habitat cover type along the William Floyd Parkway should not affect any of these rare communities, as they are not located near the Project area. Also, no impacts to the Peconic River, either short- or long-term, are anticipated. For further discussion on the pipeline alignment through the Central Pine Barrens see section 3.8.3.

The Central Pine Barrens portion of the pipeline was aligned to maximize the use of existing utility and transportation corridors, thereby minimizing potential impacts to vegetation and sensitive lands. Iroquois proposes to collocate the ELI pipeline corridor with existing ROW, generally a distance of 20 feet from the edge of the pavement of the travel lane on the William Floyd Parkway and 15 feet from the edge of pavement on the Long Island Expressway. Along the William Floyd Parkway this alignment would generally result in the need to permanently clear a 30-foot-wide corridor of forested habitat and temporarily clear a 25-foot-wide corridor of forest habitat that would be allowed to revegetate. Within the CPA the pipeline would be fully collocated with existing utility and road ROWs, thereby minimizing tree clearing and any potential forest fragmentation. Temporary workspaces would be condensed and break down lanes or travel lanes along the William Floyd Parkway may be used as alternative temporary workspaces.

In its response to our April 23, 2002 data request question 042, Iroquois indicated that a total of 116.8 acres of forested land would be cleared within the Central Pines Barrens. Upon further questioning, Iroquois clarified that this was actually the total acreage affected in the Central Pine Barrens, not the forested portion. Iroquois then determined that the pipeline would affect approximately 61.1 acres of forested land within the designated boundaries of the Central Pine Barrens. Of this, 40.8 and 20.3 acres of forested habitat in the CGA and CPA would be affected, respectively. Of the 40.8 acres of forested habitat affected in the CGA, 19.3 acres would be permanent. Of the 20.3 acres of forested habitat affected in the CPA, 11.7 acres would be permanent. The proposed HDD of the Carmans River is expected to avoid direct impacts to approximately 1,330 feet of upland and forest habitat within the Central Pine Barrens. However, we believe there are 3 additional segments of the proposed route within the Central Pine Barrens where Iroquois could use the HDD to further reduce impacts to vegetation, particularly forested land in the CPA. These segments are from Mps from MP 21.1-21.9, 22.9-23.8 and 25.2-25.6. Therefore, we **recommend that:**

> **Iroquois should develop detailed, site-specific construction plans (including scaled drawings identifying areas to be disturbed by construction) for crossing MP 21.1-21.9, 22.9-23.8, and 25.2-25.6 of the Central Pine Barrens using HDD. Iroquois should file the plans with the Secretary for review and written approval from the Director of OEP prior to construction.**
>
> **Iroquois should develop a site-specific contingency plan for each HDD crossing in the event HDD is determined to not be feasible at the site. The site-specific contingency plan should identify the potential impacts to the Central Pine Barrens with using another crossing method. The information should be filed with the Secretary for review and written approval by the Director of OEP prior to construction and at the time the contingency plans are filed with other permitting agencies.**

Within the Central Pine Barrens, Iroquois would use a seed mixture that would include recommended native seed stock as identified in the Central Pine Barrens Comprehensive Land Use (CLU) Plan, and avoid the use of invasive, nonnative plants also identified in the CLU Plan.

Iroquois has sited the proposed pipeline, aboveground facilities, and related workspaces to minimize short-term, long-term, and cumulative impacts to vegetative communities, and would adhere to our Plan and Procedures during construction and restoration activities. Overall, we believe that the ELI Project would not have a significant impact on vegetation resources.

3.6 ENDANGERED AND THREATENED SPECIES

To comply with the requirements of Section 7 of the ESA, Iroquois, as a non-federal party, has assisted the Commission in meeting Section 7 requirements by conducting informal consultation with the FWS and NMFS, by reviewing endangered, threatened, and rare species databases maintained by appropriate state Natural Heritage Programs, and filing this information with FERC.

Section 7 of the ESA requires a Federal agency to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of a federally listed endangered or threatened species or result in destruction or adverse modification of the designated critical habitat of a federally listed species. The agency is required to consult with the FWS and/or the NMFS to determine whether any federally listed or proposed species or critical or proposed critical habitat may occur in the project area, and to determine the proposed action's potential effects on these species or critical habitats. If the project would affect a listed species, the agency must report its findings to the FWS in a Biological Assessment (BA).

We request that the FWS and NMFS consider this DEIS as our BA for the proposed project. The DEIS, as our BA, is being provided to the appropriate FWS and NMFS offices for their review under Section 7 of the ESA.

3.6.1 Federally-Listed or Proposed Endangered and Threatened Species

We have identified nine federally-listed endangered or threatened species that potentially occur in the ELI Project area. Eight of the nine species were listed for the Long Island Sound crossing and the maritime beach landfall and one species was listed for the Dover compressor station. These species, their status, and areas where they are likely to occur in the ELI Project area are listed in table 3.6.1-1. A discussion of the shortnose sturgeon, loggerhead, green, leatherback and Kemp's ridley sea turtles, bog turtle, piping plover, bald eagle, and roseate tern including their range, distribution, habitats, the reasons for their decline, and probable location along the project, is provided below.

Shortnose Sturgeon

The shortnose sturgeon was listed as endangered throughout its range on March 11, 1967. This species is an diadromous fish that spawns in coastal rivers along the east coast of North America from the St. John River in Canada to the St. John's River in Florida. Its preferred habitats include the nearshore marine, estuarine, and riverine habitats of large river systems. Shortnose sturgeon do not appear to make long-distance offshore migrations similar to other anadromous species such as shad or salmon (NMFS, 2002b).

TABLE 3.6.1-1
Federally-Listed Endangered and Threatened Species that Potentially Occur in the Vicinity of the ELI Project

Species	Status[a/]			Habitat/Location
	Federal	Connecticut	New York	
Fish				
Shortnose Sturgeon *Acipenser brevirostrum*	FE	SE	SE	Estuaries; Long Island Sound
Reptiles				
Loggerhead Sea Turtle *Caretta caretta*	FT	ST	ST	Estuaries; Long Island Sound
Atlantic Green Sea Turtle *Chelonia mydas*	FT	ST	ST	Estuaries; Long Island Sound
Bog Turtle *Clemmys muhlenbergii*	FT	SE	SE	Wetlands; Dover Compressor Station
Leatherback Sea Turtle *Dermochelys coricea*	FE	SE	SE	Estuaries; Long Island Sound
Kemp's Ridley Sea Turtle *Lepidochelys kempi*	FE	SE	SE	Estuaries; Long Island Sound
Birds				
Piping Plover *Charadrius melodus*	FT	---	SE	Maritime beach; New York
Bald Eagle *Haliaeetus leucocephalus*	FT	SE	SE	Open water; Long Island Sound, Rivers
Roseate Tern *Sterna dougallii*	FT	SE	SE	Nesting-Faulkner Island, Foraging-open water; Long Island Sound

a/ Status
FT=Federally listed as threatened
FE=Federally listed as endangered
SE=State listed as endangered
ST=State listed as threatened

This species is found in two water bodies adjacent to Long Island Sound: the Hudson River and the Connecticut River (NYSDEC, 2001; McDaniel, 2001; Thalhauser, 2001). Shortnose sturgeon may be found in rivers, estuaries, and in marine waters, but populations are confined mostly to natal rivers and estuaries (NMFS, 1998). Many tagging and telemetry studies in rivers throughout the species' range indicate that these fish remain in their natal river or within the river's estuary (NMFS, 1998). No surveys for the shortnose sturgeon have been conducted by Iroquois in the project area and no previous surveys were identified that occurred in the ELI Project area.

Juveniles and adults are benthic (bottom) feeders, consuming a wide variety of crustaceans, bivalves, and worms. Generally, females spawn every three years, whereas males spawn every year (NMFS, 2002b). Spawning migrations begin during the late winter to early summer, occurring later in the year at higher latitudes. Juvenile sturgeons remain in fresh water during the first summer of life and then migrate to deeper, more brackish water in the winter months.

Marine Turtles

Four species of federally protected sea turtles have been documented as occurring within Long Island Sound on occasion (Rusanowski, 2001; CTDEP, 1998). The leatherback and Kemp's ridley sea turtles are listed as endangered and the loggerhead and green sea turtles are listed as threatened. Historic records demonstrate the occurrence of all four species in Long Island Sound. The marine turtles found in Long Island Sound do not breed there and their occurrence in Long Island Sound is limited to the warmer months (June through November) when their primary activity is feeding (Klemens, 1993; FWS, 1997).

Green Turtle

The green sea turtle was listed as threatened in 1978. This species is distributed throughout the world's oceans between 35 degrees north and south latitude. They are found in the eastern and western hemispheres and nest on beaches throughout the Atlantic, Pacific, and Indian Oceans (Oceanic Resource Foundation [ORF], 2000). This thoroughly aquatic turtle rarely comes to land except to bask, sleep, or lay eggs. Green sea turtles are primarily herbivorous, congregating near food sources - primarily sea grasses and seaweeds found just below the surface of the water, or submerged aquatic vegetation, and are found in waters of the northeast United States from June through October (FWS, 2002a). Typically, the best foraging grounds are located great distances from preferred nesting beaches, thus green sea turtles have evolved complex migratory habits (Evergreen Project, 1999).

Adult green sea turtles reach sexual maturity between 20 and 50 years (NMFS, 2002a). Every second or third year, sexually mature adults migrate for great distances to their natal beaches to mate and lay eggs (Evergreen Project, 1999). Total population estimates for the green sea turtle are unavailable, and trends are particularly difficult to assess because of wide year-to-year fluctuations in numbers of nesting females, difficulties of conducting research on early life stages, and long generation time. Present estimates range from 200 to 1,100 females nesting on Unites States beaches. No designated critical habitat occurs in the vicinity of the ELI Project area nor are any nesting beaches of the green sea turtle known to exist on Long Island Sound.

Kemp's Ridley Turtle

The Kemp's ridley turtle was listed as endangered throughout its range in 1970. Its status has remained unchanged and is considered the most at-risk of all sea turtles (FWS 1992). This species inhabits tropical and subtropical waters of the western North Atlantic, with adults almost exclusively restricted to the Gulf of Mexico (Marquez-M 1994). Adult Kemp's ridley turtles inhabit shallow coastal and estuarine waters feeding chiefly on portunid crabs (FWS 1992). This species is most often found within several miles of the shore in water depths less than 165 feet (Fritts et al. 1983).

Nesting occurs from April to July and is essentially limited to a single stretch of beach (Rancho Nuevo) on the northeastern coast of Mexico (FWS 1992). Age at sexual maturity is not known, but it is believed to be approximately seven to 15 years, although other estimates of age at maturity range as high as 35 years (NMFS 2002a).

Individual Kemp's ridley turtles, usually two- to five-year old juveniles, are commonly found in the eastern part of the New York Bight from June to October feeding on spider and green crabs. A large portion of the surviving population of this species uses the Bight annually in its development cycle, and the region is of considerable importance to the survival and recovery of the Kemp's ridley turtle. It appears that this species uses this area as a one-time juvenile development/feeding area, not returning as adults. Favorite areas include the Peconic Estuary, Gardiners Bay, and Block Island Sound (FWS 2002b). The eastern portion of Long Island Sound is foraging habitat of considerable importance for juveniles of this species who feed on green crab (FWS 1997). Critical habitat has not been designated nor have any known nesting beaches for this species been identified within Long Island Sound.

Leatherback Turtle

The leatherback turtle was listed as endangered throughout its range in 1970. The leatherback turtle is the largest living sea turtle (NMFS 1999). This species is distributed throughout temperate and tropical waters of the northern and southern hemispheres. This species is highly pelagic, generally approaching shores only during the reproductive season.

The leatherback turtle is well adapted to temperate climates because of its ability to thermoregulate; thus it is one of the most widely distributed of all marine turtles. Their breeding grounds are located in the tropical and subtropical latitudes, although they are regularly seen in more temperate areas (Poland 1996). Nesting on the east coast of the United States occurs from February to July as far north as Georgia (NMFS 1999). Leatherbacks nest only on high-energy, steep shelving beaches immediately adjacent to deep water and where there are no fringing reefs. Nests are located on or just above the high-water mark.

The leatherback turtle is a common marine species in the waters of the northeastern United States from May through November. Adults and juveniles are both found feeding in the near coastal areas, but rarely in bays, estuaries, and lagoons. Critical habitat has been designated for this species in the Caribbean Sea. However, no such critically designated habitat or any known nesting beach of this species is known to occur in Long Island Sound or in the vicinity of the ELI Project area.

Loggerhead Turtle

The loggerhead turtle was listed as threatened throughout its entire range in 1978. This species is distributed circumglobally throughout temperate, subtropical, and tropical waters of the northern and southern hemispheres, inhabiting continental shelves, bays, estuaries, and lagoons. Adults of the species inhabit the continental shelf and estuarine environments while hatchlings are pelagic, often being associated with sargassum and/or debris in pelagic drift lines (Carr 1986). In the Atlantic, the loggerhead turtle's range extends from Newfoundland to as far south as Argentina. During the summer months, nesting occurs in the lower latitudes of this range. Courtship and mating occur offshore of nesting beaches between late March and early June with nesting occurring between late May and mid September (Fritts et al. 1983).

In the spring and fall, loggerheads are concentrated south of New Jersey in the continental shelf waters, arriving in the New York Bight and Long Island Sound as early as May. Juveniles are found in coastal bays of Long Island Sound. In coastal waters, spider crabs are their dominant food item, however, they will feed on horseshoe, green, blue, and lady crabs (FWS 2002c). Loggerheads are capable of inhabiting a variety of environments including brackish waters of coastal lagoons and the mouths of rivers. No critical habitat has been designated in Long Island Sound for this species, and similarly, no known nesting beaches of the loggerhead turtle are known to occur in Long Island Sound or in the vicinity of the ELI Project area.

Bog Turtle

The bog turtle was listed as threatened in 1978. In New York, the bog turtle emerges from hibernation, often spent in an abandoned muskrat lodge or other burrow, by mid-April. In New York bog turtles often hibernate communally with other bog turtles and with spotted turtles. Generally, both the air and water temperature must exceed 50°F for the turtle to become active. Mating occurs primarily in the spring but may also occur in the fall and may be focused in or near the hibernaculum (winter shelter). In early to mid-June, a clutch of two to four eggs is laid in a nest which is generally located inside the upper part of an unshaded tussock. The eggs hatch around mid-September. Some young turtles spend the winter in the nest, emerging the following spring. The adults enter hibernation in late October. Sexual maturity may be reached at 8 years or as late as 11 years. A bog turtle may live for more than 30 years (NYSDEC 1998).

The bog turtle is considered semi-aquatic, preferring habitat with cool, shallow, slow-moving water, deep soft muck soils, and tussock-forming herbaceous vegetation. In New York, the bog turtle is generally found in open, early successional types of habitats such as wet meadows or open calcareous boggy areas generally dominated by sedges or sphagnum moss (NYSDEC 1998).

The bog turtle was listed by the FWS as potentially occurring in the area of the Dover Compressor station. More than half of the 74 historic bog turtle locations in New York still contain apparently suitable habitat. Only one quarter of these sites, however, are known to support extant populations, primarily in southeastern New York. The primary threats to this species are loss or degradation of habitat and illegal collecting (NYSDEC 1998). Development, especially roads, residential, commercial and reservoir construction, inhibits the species' ability to move to new, potential habitat.

Piping Plover

The piping plover was listed as threatened in 1985. The maritime beach, at which the pipeline alignment comes ashore from the Long Island Sound, is potential nesting habitat for the piping plover. Piping plovers nest above the high tide line on coastal beach, sand flats, and the end of sand pits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, sparsely vegetated dunes, and washover areas cut into or between dunes. Piping plovers arrive at their breeding grounds around mid-March. Nesting generally commences in late March or early April, and may last until August. Egg laying occurs from May to June. By mid-September, both adults and young piping plovers will depart breeding grounds for their wintering areas. Feeding areas include intertidal portions of ocean and bay beaches, washover areas, mudflats, sandflats, wrack lines, and shorelines of coastal ponds, lagoons, or salt marshes (FWS 1996).

Field surveys of the maritime beach area in September of 2001 identified several natural features that make this habitat suitable for piping plover nesting and foraging. The beach is sandy with no pronounced dune along the mean high water tide line. Piping plovers prefer these habitats, because the gently sloping beach affords an unobstructed view around the nest for predator avoidance.

Bald Eagle

The bald eagle was listed as threatened in 1967. The bald eagle is found in Connecticut and New York in association with major river systems, lakes, and large reservoirs. Historically, populations of bald eagles were drastically reduced, principally due to low reproductive success as a result of the bioaccumulation of pesticides. Since the banning of organochlorine pesticides such as DDT, populations of this species have been recovering. Habitat fragmentation and loss, collisions with cars and powerlines, and shooting continue to threaten this species. Because bald eagles often return to nest in the vicinity in which they were raised, emphasis has been placed on protecting habitats where successful breeding has been known to occur.

Roseate Tern

Roseate terns breed on small offshore islands, rocks, bays, and inlets with nests typically hidden under protective cover such as rocks, vegetation, or washed-up debris. Roseate terns are known to nest on Faulkner Island, which is part of the Stewart B. McGivney National Wildlife Refuge and is located more than 4 miles from the pipeline route. Approximately 150 to 200 roseate terns have nested annually on Faulkner Island for the past decade (FWS 2001), making it the third largest nesting colony of this species in the northeastern United States. The birds typically arrive on Faulkner Island at the end of April with eggs appearing 3 to 4 weeks later. After hatching, adults forage for fish to feed the young and may travel over 12 miles to foraging areas (Spendelow, 1995). Roseate tern populations are threatened by competition with gulls, aerial predators, and loss of suitable nesting habitat.

3.6.2 Other Special-Status Species

In addition to the nine federally-listed endangered and threatened species, 45 other special status species were identified by the NYSDEC as potentially occurring in the project area. There were no species identified by the CTDEP as potentially occurring in the vicinity of the ELI Project area (see table 3.6.2-1). These special status species include Federal species of concern, and state-listed special concern and proposed endangered or threatened species. The state-listed species include one bird, one amphibian, one reptile, three invertebrates, and 39 plants. These species, their status, and brief habitat descriptions are provided in table 3.6.2-1.

3.6.3 General Construction and Operation Impact

Several commentors requested that Iroquois evaluate the impacts that the ELI Project would have on endangered and threatened species. The general construction and operational impacts of the ELI Project as discussed in sections 3.4.2, Wildlife Resources, and 3.5.2, Vegetation, would also apply to endangered and threatened plants and wildlife species. However, because the distribution and abundance of federal- and state-listed endangered and threatened species are limited, any impact

TABLE 3.6.2-1
Other Special Status Species that Potentially Occur in the Vicinity of the ELI Project

Species	Status [a] New York [b]	Habitat
Plants		
Swamp Pink *Arethusa bulbosa*	ST	Bogs and wet meadows
Silvery Aster *Aster concolor*	SE	Dry, sandy soils, woods-pine barrens
Heath Aster *Aster pilosus v. pringlei*	ST	Open fields and roadsides
Flax-Leaf Whitetop *Aster solidagineus*	ST	Dry woodlands and open fields
Side-Oats Gramma [c] *Bouteloua curtipendula*	SE	Dry, open meadow or prairie
Button Sedge *Carex bullata*	SE	Sedge meadow
Rose Coreopsis *Coreopsis rosea*	SR	Pond margins
Dwarf Hawthorne *Crataegus uniflora*	SE	Dry woodlands and barrens
Three-Ribbed Spikerush *Eleocharis tricostata*	SE	Pond margins
White Boneset *Eupatorium album v. subvenosum*	ST	Pond margins
Small White Snakeroot *Eupatorium aromaticum*	SE	Dry open woods
Round-Leaf Boneset *Eupatorium rotundifolium v. rotundifolium*	SE	Woods and open fields
Huckleberry *Gaylussacia dumosa v. bigeloviana*	SE	Bogs or barrens
Purple Everlasting *Gnaphalium purpureum*	SE	Wet disturbed pine barrens
Slender Blue Flag *Iris prismatica*	ST	Rich meadows
Scirpus-Like Rush *Juncus scirpoides*	SE	Pond and river margins

TABLE 3.6.2-1 (continued)
Other Special Status Species that Potentially Occur in the Vicinity of the ELI Project

Species	Status a/ New York b/	Habitat
Slender Pinweed *Lechea tenuifolia*	ST	Woods, pine barrens, sandy soils in woods
Northern Blazing Star *Liatris borealis*	ST	Dry sandy soil
Farwell's Water-Milfoil *Myriophyllum farwellii*	ST	Rivers and ponds
Clustered Bluets *Oldenlandia uniflora*	SE	Pond margins
Wright's Panic Grass *Panicum wrightianum*	SE	Open fields
Virginia Ground Cherry *Physalis virginiana*	SE	Dry fields
Erect Knotweed *Polygonum erectum*	SE	Open fields, disturbed areas
Water-Thread Pondweed *Potamogeton diversifolius*	SE	Open water/ponds
Spotted Pondweed *Potamogeton pulcher*	ST	Acidic ponds and muddy shores
Silverweed *Potentilla anserina egedii*	ST	Saltmarsh
Wafer-Ash *Ptelea trifoliata*	SE	Woods and roadsides
Short-Beaked Bald-Rush *Rhynchospora nitens*	ST	Wet sandy soils and bogs
Giant Beardgrass *Saccharum giganteum*	U	Open fields and roadsides
Few-Flowered Nutrush *Scleria paucifloa v. caroliniana*	SE	Pond margins
Whip Nutrush *Scleria triglomerata*	ST	Pond margins
Sea Purslane *Sesuvium maritimum*	SE	Salt marsh
Coastal Goldenrod *Solidago elliottii*	SE	Marshes and wet meadows
Rough Goldenrod *Solidago rugosa ssp aspera*	SE	Open fields and roadsides

TABLE 3.6.2-1 (continued)
Other Special Status Species that Potentially Occur in the Vicinity of the ELI Project

Species	Status [a] New York [b]	Habitat
Swamp Oats *Sphenopholis pensylvanica*	SE	Wooded swamps and wet meadows
Rough-Hedge Nettle *Stachys hyssopifolia*	ST	Sandy pond margins
Small Floating Bladderwort *Utricularia radiata*	ST	Open water/ponds
Fibrous Bladderwort *Utricularia striata*	ST	Open water/ponds
Primrose-Leaf Violet *Viola primulifolia*	ST	Moist meadows and pond margins
Invertebrates		
Herodias Underwing *Catocala herodias gerhardi*	U	Open fields and roadsides
Mottled Duskywing *Erynnis martialis*	U	Meadows
Persius Duskywing *Erynnis persius persius*	SE	Pine oak forest
Amphibians/Reptiles		
Tiger Salamander *Ambystoma tigrinum*	SE	Open water/pond margins and adjacent forest
Timber Rattlesnake [c] *Crotalus horridus*	ST	Rocks, boulders, crevices, hardwood forest
Birds		
Least Tern *Sterna antillarum*	ST	Maritime beach

a/ Status
SE=State listed as endangered
ST=State listed as threatened
SR=State listed as rare
U=Unprotected
b/ No species listed by the CTDEP were identified as potentially occurring in the vicinity of the proposed Brookfield and Devon compressor stations in CT.
c/ These species were listed by the NYSDEC for the Dover compressor station.

could affect the size or viability of these populations. Habitat availability is believed to be the primary limiting factor of some endangered and threatened species. Therefore, the loss or alteration of suitable habitat could contribute to the decline of some species' populations.

3.6.4 Site-Specific Impact

3.6.4.1 Federally-Listed or Proposed Endangered and Threatened Species

Potential impacts to threatened and endangered species may arise from petroleum spills, disturbance of sensitive habitats, disturbance of important activities such as feeding, breeding, or nursing, or with vessel collisions (Brosius et al. 1983). The potential for project-related impacts to the Federally-listed endangered and threatened species discussed in section 3.6.1 are discussed in detail below.

Shortnose Sturgeon

Impacts to the shortnose sturgeon are not anticipated because shortnose sturgeons occur primarily in the lower portion of the Hudson and Connecticut rivers. Both of these river mouths are of considerable distance from the ELI Project area (NYSDEC, 2002; McDaniel, 2001; Thalhauser, 2001). Because this species prefers estuarine environments rather than open marine environments, such as Long Island Sound, they are not likely to be found in the vicinity of the ELI Project area. In addition, no critical habitat has been designated for the shortnose sturgeon in Long Island Sound or its adjacent waters. Because of their mobility, this species does have the potential to be a transient species through the ELI Project area during construction, however it is anticipated that avoidance of construction activities would be likely. Therefore, it is anticipated that construction and maintenance of the ELI Project would be unlikely to adversely affect the shortnose sturgeon or its habitat.

Marine Turtles

Most discussions of potential impacts to endangered sea turtles from oil and gas activities have concerned the possibility of releases of oil (Brosius et al. 1983; MMS 1998). Sea turtles are presumed to be impacted by such releases, either directly, by oiling of the turtle or their eggs, or indirectly, through contamination of their food source. Iroquois would transport only processed, market-ready natural gas. Therefore, the potential impacts associated with oil spills are non-existent. Although minor releases of vessel fuel or lubricants may occur during construction and maintenance, impacts associated with this release are expected to dissipate quickly in surrounding waters and that such releases are considered minor and sublethal. Iroquois would adhere strictly to its SPCC Plan to prevent any unintentional discharge of solid waste or fuels so as not to affect water quality or the potential for marine turtles to get tangled or ingest fuel or solid discharges.

Brosius et al. (1983) evaluated the potential impacts of proposed pipeline construction in the mid-Atlantic region of the OCS, and concluded that the primary impact would be the disturbance of sea turtle feeding activities and feeding areas. This disturbance would presumably be due to increased vessel traffic, and more importantly, the trenching associated with pipeline installation. Trenching would temporarily remove any potential sea turtle prey items from the immediate area and suspend large volumes of sediment in the water. Suspension of sediment volumes could temporarily deplete the down current area of sea turtle prey items (i.e., jellyfish, seagrasses, and crabs). As suspended sediments are re-deposited on the seafloor down current, there would be additional mortality or dispersal of sea turtle prey items. These impacts are expected to be short-term and minimal, given the proportion of available habitat that would be impacted. Sea turtles may be temporarily displaced from construction areas but would be expected to return to these areas after the pipeline has been installed and sediments are re-deposited. Brosius et al. (1983) believed that sea turtles would simply avoid construction areas, but concluded that this avoidance would not constitute or result in a major disruption of important behavioral patterns (e.g., feeding).

Construction of the ELI Project in marine habitat is scheduled to occur in the winter months (December through March). Marine turtles are most commonly found in the coastal waters of New York and Long Island Sound during the warmer months of the year (June through November). Construction disturbances associated with the ELI Project, including short-term elevation of noise levels, sediment re-suspension, reduced dissolved oxygen concentrations, and water quality disturbances, are not anticipated to adversely impact the four marine turtles known to occur and that potentially may occur in the construction area because the proposed in-water construction will occur at a time when few, if any, marine turtles are likely to be present.

Although the proposed construction activities may result in minor modifications of movement patterns of the few turtles that may be present during the time of marine construction, the proposed project will not result in habitat modification or degradation that significantly impairs essential behavior patterns or results in death of or injury to marine turtles. Long Island Sound, specifically the eastern portion, is an essential foraging habitat for Kemp's ridley turtle juveniles that feed on green crab (FWS 1997); however, the ELI Project would be confined to the western portion of Long Island Sound outside of this essential habitat area. In addition, green crabs inhabit shallow intertidal estuaries with low salinity and some vegetative cover. This habitat is not common in the ELI project area. Therefore, it is unlikely that this species' juvenile foraging habitat would be adversely affected by the ELI Project. Furthermore, designated critical habitat does not occur within Long Island Sound, adjacent waters, or in the vicinity of the proposed route alignment for any of the four listed marine turtles. Similarly, no nesting beaches are known to occur in this area. Therefore, it is anticipated that construction and ROW restoration for the ELI Project would be unlikely to adversely affect marine sea turtles or their habitat.

Bog Turtle

The FWS specifies that wetlands within the ELI Project area, specifically at the Dover Compressor Station, be evaluated for any existing bog turtle habitat, and its potential to support the bog turtle. Site-specific surveys of the proposed Dover Compressor Station found no wetlands or suitable habitat to exist within 50 feet of the proposed construction footprint, therefore, it is anticipated that construction and ROW restoration for the ELI Project would not affect the bog turtle or its habitat.

Piping Plover

Construction of the landfall at Shoreham on Long Island would temporarily disturb piping plover habitat. However, Iroquois' construction of the landfall and hydrostatic testing activities are proposed to be completed after or prior to piping plover inhabitation of the area. Additionally, Iroquois would restore the beach front to preconstruction conditions in accordance with our Plan and Procedures.

The FWS and the NYSDEC recommended for the Islander East Pipeline Project (FERC Docket No. CP01-384) that the use of HDD should be considered at the Long Island landfall to avoid disturbing piping plover nesting habitat. In addition, the FWS recommended that if the HDD method is used, that the pipeline be deep drilled to avoid cave-ins of the beach habitat. The NYSDEC recommended for the ELI project (in comments filed on 7-3-02) that all disturbance within 500 feet of the beach must be avoided during the breeding and nesting season extending from April 1 to September 1 of every year. Therefore, **we recommend that:**

> **Iroquois should install its pipeline at the landfall on Long Island using the HDD method; develop a detailed, site-specific construction plan (including scheduling and scaled drawings identifying areas to be disturbed by construction) for the landfall at Long Island in consultation with the FWS and NYSDEC; and file the plan and all oral and written comments from the FWS and NYSDEC regarding it with the Secretary for review and written approval from the Director of OEP, prior to construction.**
>
> **Additionally, Iroquois should develop a site-specific contingency plan in case the HDD is determined to be infeasible at the site. Iroquois should consult with the FWS and NYSDEC to identify the potential impacts to the beach habitat from using another method, and to develop conservation measures to avoid or reduce impacts. The information should be filed with the Secretary for review and written approval by the Director of OEP, prior to construction.**

The FWS further indicated that if the HDD is not deep drilled or if testing and maintenance activities in the area of the beach habitat occur between April 1 and September 1 then a biological assessment or further consultation may be required. Because consultation has not been completed, **we recommend that:**

> **Iroquois should continue consultation with the FWS and the NYSDEC regarding the piping plover and any requirements for surveying, monitoring, or avoiding piping plovers and their habitat. Iroquois should not begin construction activities until:**
>
> **a. the staff receives comments from the FWS regarding the proposed action;**
> **b. the staff completed formal consultation with the FWS, if required; and**
> **c. Iroquois has received written notification from the Director of OEP that construction or use of mitigation may begin.**

With implementation of our conservation recommendations, and Iroquois' proposed schedule for its facilities construction, hydrostatic testing and ROW restoration, we believe that the ELI Project would be unlikely to adversely affect the piping plover or its habitat.

Bald Eagle

The proposed pipeline route would not cross bald eagle nesting or wintering habitat. Therefore, it is anticipated that construction and maintenance of the ELI Project would be unlikely to adversely affect on the bald eagle or its habitat.

Roseate Tern

The FWS noted the presence of nesting roseate terns on Faulkner Island. Although nesting roseate terns would be avoided by the proposed route, the FWS reported that it is likely that foraging terns would occur in the construction ROW during construction. However, because construction across the Long Island Sound is scheduled to be completed prior to roseate tern inhabitation of the area, impact to foraging terns would be avoided. Therefore, the ELI Project would be unlikely to adversely affect the roseat tern or its habitat.

Summary of Potential Effects to Federally Listed or Proposed Endangered or Threatened Species

Based on our analysis in this BA of the 9 federally listed species, we have determined that with implementation of Iroquois' proposed construction procedures, and our recommended conservation measures contained herein, the project would not affect one species (bog turtle), and is not likely to adversely affect the other eight (shortnose sturgeon, all four sea turtles, piping plover, bald eagle and roseate tern). A final determination of the impact of the project on all these species cannot be reached until Iroquois files final comments from, or we receive final comments directly from the FWS and NMFS. Therefore, we **recommend that:**

- **Iroquois should not begin any construction activities or conservation measures until:**

  a. **we receive concurrence from NMFS and FWS regarding the effects of the proposed project on federally listed or proposed threatened or endangered species identified in section 3.6 of this DEIS;**

  b. **we complete consultation with the NMFS and FWS in accordance with Section 7 of the ESA; and**

  c. **Iroquois has received written notification from the Director of the OEP that construction or use of conservation measures may begin.**

3.6.4.2 Other Special Status Species

The ELI Project area is not believed to contain any of the 39 plant species listed in table 3.6.2-1, as determined from field surveys and a review of the habitat preferences of the individual species. Site-specific field surveys were conducted for 13 of the 39 plant species listed in table 3.6.2-1 and habitat preferences of the remaining 26 plant species indicated that habitat for only four of the species (slender blueflag, white boneset, slender pinweed, and silvery aster) potentially exists along the pipeline corridor. The slender blueflag and white boneset prefer wetland habitats and may occur in the wetlands associated with the Carmans River. A survey of the wetlands associated with the Carmans River conducted by the Islander East Pipeline Company for the proposed Islander East Pipeline Project (FERC Docket No. CP01-384) found a population of button sedge at the interface of a palustrine emergent and palustrine forested plant community. Impacts to species associated with the Carmens River wetlands would be avoided due to the proposed HDD crossing method. The slender pinweed and silvery aster potentially occur in the Yaphank area (~MP 27.9) of the proposed alignment where survey permission has not been granted. Iroquois proposes to survey for these species once land owner permission is granted.

The remaining 22 species, including the side-oats grama listed for the Dover Compressor Station, generally occur in salt marsh, upland, or disturbed habitat. Twenty-one of these species would most likely occur in the salt marshes and adjacent upland areas around the Wading River and the side-oats grama is known to occur in the cinder bed of a railroad located approximately 2,000 feet from the proposed Dover Compressor Station. Salt marsh associated with the Wading River is located approximately 400 feet east of the proposed pipeline and the Wading River itself is located approximately 2,000 feet east of the pipeline. Therefore, based on the location of potential habitat outside the ELI Project areas, impacts to these 22 species are not anticipated.

The persius duskywing inhabits pine/oak forest which would be directly impacted by the proposed ELI Project. No field surveys for the persius duskywing have been conducted by Iroquois. Iroquois should consult with the NYSDEC regarding the need to survey for the persius duskywing in potential habitat along the proposed pipeline route.

A survey of potential tiger salamander habitat and individuals along the Iroquois proposed pipeline route was conducted by the Islander East Pipeline Company for the proposed Islander East Pipeline Project (FERC Docket No. CP01-384) in the spring of 2002. The survey involved trapping of migrating salamanders and searching for egg masses during major rain events in March and April, 2002 at the 10 sites identified by the NYSDEC and the Islander East Pipeline Company. A review of the survey report indicates that three potential breeding ponds were located within 2000 feet of the proposed ELI pipeline route, one of which is within 2000 feet, one of which is within 1000 feet, and one of which is within 500 feet. No tiger salamanders or indications of breeding activity were found at the two furthest sites and the closest site was found to be dry. However, the closest site has the potential to provide tiger salamander habitat during years when conditions are less dry. The NYSDEC has requested that Iroquois discuss potential mitigation measures for any portion of the pipeline construction where disturbance would occur within 1,000 feet of any documented breeding habitat. To avoid impacts on potential tiger salamander breeding ponds, **we recommend that:**

> **Iroquois should consult with the NYSDEC to determine whether mitigation measures are needed to protect habitat for the eastern tiger salamander. All oral and written comments or recommendations that Iroquois receives from the NYSDEC should be filed with the Secretary, prior to construction.**

The NYSDEC indicated that the timber rattlesnake is known to inhabit a ledge face associated with Dobar Mountain, which is located approximately 4,000 feet northwest of the Dover Compressor Station. However, due to the ELI Project's distance from this area, impacts to the timber rattlesnake and its habitat are not anticipated as a result of construction and maintenance of the ELI Project.

The least tern has similar distribution, breeding seasons, and habitat requirements to that of the piping plover. Due to these similarities, Iroquois would use the FWS recommendations of scheduling construction activities for the piping plover to also avoid impacts to the least tern.